CHAPTER 12 MAJOR DESIGN FEATURES OF RECOMMENDED CONCEPT

This section presents a summary of the proposed ultimate SR 303L freeway from I-10 to US 60. Plans and profiles illustrating the concept are provided in Chapter 15, and right-of-way needs are provided in Chapter 16. Each major feature is discussed in a separate section to aid the reader in quickly finding the element of interest. The project begins at Van Buren Street south of I-10 and extends some 15 miles northward to just north of US 60 (Grand Avenue). The typical sections for the ultimate and initial construction of SR 303L are shown in Figure 11-1.

12.1 ROADWAY PROFILE

At Van Buren Street, SR 303L will be elevated and then descend going northward. The freeway will go over a box structure to be constructed to carry the RID canal. Going northward the mainline will be depressed at the I-10 frontage roads, I-10, and McDowell Road. At Thomas Road the freeway will be partially depressed. Between McDowell and Thomas roads, the freeway can be fully to partially depressed depending upon earthwork needs at the time the specific projects have been identified. North of Thomas Road, the mainline will elevate over each of the section line cross roads from Indian School Road to Waddell Road (all cross streets will remain at grade). The freeway will return to near ground level between cross roads. North of Waddell Road, the profile will again become depressed with the cross streets crossing over the freeway. At Greenway Road, the mainline will be partially depressed and the cross street partially elevated. This configuration will facilitate gravity draining the roadway storm drains to the south. At Bell Road, the freeway will be fully depressed. North of Bell Road to US 60, the profile will match the existing interim road constructed by MCDOT for SR 303L, which is partially depressed. SR 303L will be elevated over US 60 and the BNSF railroad. A second bridge similar to the existing Patriot's Bridge will be constructed for the ultimate northbound lanes.

Every effort has been made to keep cross streets at grade where possible by either elevating or depressing SR 303L. By keeping the majority of the cross streets at grade, access and visibility to the properties located at these intersections will be maximized.

12.2 EARTHWORK

The extensive earthwork required for an overall project of this magnitude creates a major area of concern. Economies in earthwork may be obtained by careful selection of construction limits and phasing of the overall corridor. With the full incorporation of the regional drainage system as the off-site drainage system for the roadway, the ability to balance earthwork over a regional length of the corridor is greatly aided.

Preliminary geotechnical analysis of borings taken in the area indicates that an appropriate shrinkage factor would be 10% to 15% for borrow from an in-situ source and 21% for borrow taken from a stockpiled source. Since the sources of borrow are not known at this time, and it is anticipated that the regional drainage system incorporated into the highway project will provide a source for most of the fill, an overall general shrinkage factor of 15% was applied to all embankment quantities. A summary of the earthwork quantities is presented in Table 12-1 below.

Table 12-1 Summary of Earthwork Quantities

Roadway Segment*		Roadway Excavation (CY)	Regional Drainage Excavation (CY)	Total Excavation (CY)	Roadway Embankment (CY)	Shrink (15%) (CY)	Total Embankment (CY)	Net (- = Borrow, + = Waste) (CY)
I-10 TI**	Segment 1	1,463,929	2,314,758	3,778,687	1,188,254	178,238	1,366,492	2,412,195
Thomas Rd	Segment 2	452,867	51,358	504,225	147,800	22,170	169,970	334,255
Indian School Rd	Segment 3	4,267	47,490	51,757	622,279	93,342	715,621	-663,864
Camelback Rd	Segment 4	10,867	2,026,679	2,037,546	601,366	90,205	691,571	1,345,975
Bethany Home Rd	Segment 5	6,567	48,790	55,357	600,770	90,116	690,886	-635,529
Glendale Ave	Segment 6	9,367	45,335	54,702	575,810	86,372	622,182	-607,480
Northern Ave	Segment 7	4,067	850,191	854,258	1,076,312	161,447	1,237,759	-383,501
Northern Parkway Ramps	Segment 7A	90,063	0	90,063	1,056,433	158,465	1,214,898	-1,124,835
Olive Ave	Segment 8	9,167	70,047	79,214	1,006,335	150,950	1,157,285	-1,078,071
Peoria Ave	Segment 9	5,067	46,222	51,289	655,790	98,369	754,159	-702,870
Cactus Rd	Segment 10	10,067	1,576,254	1,586,321	671,372	100,706	772,078	814,243
Waddell Rd	Segment 11	3,504	43,124	46,628	720,773	108,116	828,889	-782,261
Greenway Rd	Segment 12	502,427	23,322	525,749	90,917	13,638	104,555	421,194
Bell Rd	Segment 13	1,064,581	12,139	1,076,720	6,286	943	7,229	1,069,491
Clearview Boulevard	Segment 14	318,852	0	318,852	564	85	649	318,203
Mountain View Boulevard	Segment 15	80,569	0	80,569	5,901	885	6,786	73,783
US 60	Segment 16	1,169,066	0	1,169,066	228,932	34,340	263,272	905,794
	Totals	5,205,294	7,155,709	12,361,003	9,255,894	1,388,387	10,644,276	1,716,722

* See Figure 14-2, Cost Estimate Segments
** Excludes earthwork required for I-10 reconstruction (5+1 each direction)

The I-10 realignment through the SR 303L System TI area includes approximately 2.3 miles from east of Sarival Avenue to the Citrus Road Bridge. This realignment must occur prior to or concurrent with the system TI Phase 1 construction. There will be excess earthwork available from the drainage excavation needed for the drainage basins and channel. Even more earthwork could be available (depending upon timing) from the FCDMC construction of the drainage channel outfall from Van Buren Street to the Gila River. Since the excavation costs have been included in these other sections, no earthwork quantity was estimated for the I-10 realignment and no cost was included in Chapter 14. Coordination of earthwork among projects will be an important element.

Large basins are located at Cactus Road, Northern Avenue, Camelback Road, and McDowell Road. Two more basins are located south of Van Buren Street in the proposed FCDMC project. The regional drainage system south of Van Buren Street will generate about 1.6 million cubic yards of material. It may not be cost effective to haul this material north for use in constructing the I-10/SR 303L interchange. This excess material south of Van Buren Street could be stockpiled for use when SR 303L is extended down to at least MC 85.

Constructing the US 60 interchange will generate about one million cubic yards of material. Hauling this material farther south for further freeway construction may not be cost effective, depending on the phasing. If this material is not available for the freeway construction, then other sources of borrow will have to be identified. Further analysis regarding phasing, construction staging, and borrow sources is needed.

A preliminary discussion of the impacts to earthwork involving phased construction of the SR 303L corridor is presented in Chapter 13.

12.3 OFF-SITE DRAINAGE

The regional off-site drainage system for SR 303L includes a drainage channel and associated detention basins along the west side of the freeway (from Bell Road to the Gila River) planned by FCDMC as part of the Loop 303 Corridor/White Tanks Area Drainage Master Plan Update project. The remaining off-site drainage system from US 60 to Bell Road has been designed as part of this DCR process. These two off-site drainage systems are briefly described below.

Loop 303 Corridor/White Tanks ADMP Regional Drainage System

Significant features of the Loop 303/White Tanks Area Drainage Master Plan Update regional drainage system that are planned to be a part of the SR 303L project are as follows:

- A north-south concrete channel from Bell Road to Gila River along the west side of SR 303L. The channel is planned to convey the 100-year flow (with no freeboard) under existing conditions of development.
- Off-line and on-line detention basins along the west side of SR 303L at Cactus Road, Northern Avenue, Camelback Road, I-10, Yuma Road and MC 85. These basins are planned to meter/reduce flows into the channel.
- Upstream west-east lateral channels along Northern Avenue and I-10 feeding into the detention basins along the west side of SR 303L. These channels intercept the southeasterly flows and convey the 100-year discharges into the detention basins.
- Downstream west-east lateral pipes/channels at Northern Avenue and Camelback Road that serve as eastern outlets for the detention basins.

It may be noted that SR 303L off-site drainage improvements do not envision construction of the west-east channels. However, a more detailed hydrologic/hydraulic analysis will be necessary to investigate whether the detention basins and the north-south channel can properly function in the absence of the west-east channels or if modifications are required.

The above-described drainage system is planned to be funded jointly by FCDMC and ADOT. The FCDMC is the lead agency for the design and construction of the system from Van Buren Street to the Gila River. While the FCDMC requires that its facilities be designed for the 100-year storm event, ADOT designs for the 50-year storm event. It was agreed that this facility would be based on the 100-year storm event and that ADOT would contribute funding in an amount up to that required to construct a 50-year version of the same facility. A report entitled *Drainage System Cost Sharing Analysis* dated May 10, 2005, was prepared documenting the cost-sharing process.

Off-site Flows at the SR 303L/US 60 interchange

The off-site flows at the SR 303L/US 60 interchange are from the undeveloped tracts of land in the southwest and southeast quadrants of the interchange.

A retention basin will be provided to prevent flows from the southwest quadrant from coming onto the depressed interchange ramps. An outlet pipe with a control gate will meter the flow into an infield detention basin.

Flows from the northeast quadrant will be diverted east along SR 303L and then intercepted by a relocated culvert. An outlet ditch will be provided to bring the flows back to the natural outfall to maintain the existing pattern of flow.

Flows along US 60 will be intercepted by a storm drain and conveyed downstream to a natural outlet ditch between US 60 and the BNSF.

Off-site Flows from the SR 303L/US 60 interchange to Bell Road

The off-site drainage system for this stretch of the freeway is an update of the drainage system designed and constructed for the Estrella Roadway & Grade Separation Phase I – Union Hills Drive to Deer Valley Drive project by MCDOT (2000). Additional inlets and storm drains are required due to the wider pavement widths of the proposed 10-lane section.

The impact of off-site flows on SR 303L south of US 60 is likely to be minimal. The entire area north, west, and adjacent to SR 303L is almost entirely developed or under construction – with existing topography and retention basins precluding flows from entering the SR 303L corridor.

Retention basins for the 100-year 2-hour storm were constructed with the interim roadway. The basins located along the east side of SR 303L will continue to outlet to Sun City Grand after these proposed roadway/drainage improvements.

12.4 ROADWAY DRAINAGE

ADOT criteria have been used for designing roadway drainage facilities. Drainage criteria adopted by MCDOT, and the cities of Surprise, Glendale and Goodyear, have been considered in the design of the crossing arterial and minor arterial streets.

The ultimate roadway construction consists of the following significant drainage features:

- Storm drain systems along SR 303L roadway and ramps discharging into the regional drainage channel (along the west side of SR 303L) or detention basins
- Storm drain systems along SR 303L between Bell Road and Mountain View Road initially discharging into adjacent large detention basins and ultimately into the regional channel south of Bell Road

The above grade roadway drainage facilities will be designed for the runoff from a 10-year frequency storm event. The depressed area/sag location inlets and storm drain system will be designed for the 50-year storm event.

The initial construction will consists of a six-lane freeway with a median ditch and inlets along the (a) proposed storm drain trunk line or (b) the proposed cross storm drain line discharging into the regional channel along the west side of SR 303L.

First Flush Treatment

ADOT's current practice does not include provisions for treatment of the initial runoff from storms. This runoff may contain pollutants from the roadway. Since the drainage system is to be jointly funded with the FCDMC, they have indicated that they will require compliance with best management practices for treating the "first flush."

The first flush volume must be greater than or equal to 0.5 inches of runoff. Retention of the 100-year, 2-hour rainfall automatically takes care of the "first flush" requirement. These requirements are stated within FCDMC's document *Clarification of Drainage Regulations Section 603*. Permanent pools (that drain within 36 hours) within the proposed detention basins along SR 303L can be used to treat first flush by allowing infiltration through the underlying soil. Other first flush treatment measures include:

- Infiltration trenches
- Infiltration basins
- Sheet flow over vegetated buffer areas
- Stormceptors or similar oil/water separator inlets

12.5 STREETS AND INTERSECTIONS

The street classifications presented in this DCR were taken from the various general plans as discussed in Chapter 4. Typical sections for the cross streets are presented in Chapter 11. A summary of the cross street classifications and their relationship with the mainline is summarized in Table 12-2. Significant development is occurring along the corridor, particularly in Surprise. Plans for the cross streets may change as these developments become reality.

The cross streets will widen at interchange locations to accommodate dual left turn lanes and a right turn lane. Per ADOT standard practice, access control at service interchanges will extend along the cross road for 300 feet beyond the end of the ramp pavement radius at the intersection of the ramp and the cross street.

Thomas Road will be the north half of a split diamond that includes Van Buren Street, south of I-10.

Table 12-2 Summary of Cross Street Classifications

Street	Classification	Cross Street Profile at SR 303L	SR 303L Profile at Cross Street	Interchange Type
McDowell Road	Goodyear Major Arterial	At Grade	Depressed	Grade Separation Only w/ Frontage Roads
Thomas Road	Goodyear Arterial	Partially Elevated	Partially Depressed	Split Diamond with Van Buren Street
Indian School Road	Goodyear Major Arterial	At Grade	Elevated	Tight Diamond
Camelback Road	MCDOT Principal Arterial	At Grade	Elevated	Tight Diamond
Bethany Home Road	MCDOT Principal Arterial	At Grade	Elevated	Tight Diamond
Glendale Avenue	MCDOT Principal Arterial	At Grade	Elevated	Tight Diamond
Northern Avenue	MCDOT Principal Arterial	At Grade	Elevated	Split Diamond with Olive Avenue
Northern Parkway	Super Street	Elevated	Partially Elevated	System Interchange
Olive Avenue	MCDOT Principal Arterial	At Grade	Elevated	Split Diamond with Northern Avenue**
Peoria Avenue	Surprise Principal Arterial	At Grade	Elevated	Tight Diamond
Cactus Road	Surprise Principal Arterial	At Grade	Elevated	Tight Diamond
Waddell Road	Surprise Principal Arterial	At Grade	Elevated	Tight Diamond
Greenway Road	Surprise Minor Arterial	Partially Elevated	Partially Depressed	Tight Diamond
Bell Road	Surprise Principal Arterial	At Grade	Depressed	Tight Diamond
Clearview Boulevard*	Surprise Collector	Elevated	Depressed	Grade Separation Only
Mountain View Boulevard*	Surprise Collector	Elevated	Depressed	Grade Separation Only
US 60 (Grand Ave)*	ADOT Urban Arterial	At Grade	Elevated	System Interchange

* The grade separations at Clearview Boulevard and Mountain View Road, as well as the southbound SR 303L bridge over US 60, have already been constructed as part of MCDOT's interim SR 303L construction between Bell Road and US 60.

**ADOT has determined that the ramps to Olive Avenue cannot cross the BNSF spur railroad tracks. In follow-up design work, the ramps will be removed and replaced with frontage roads that extend from Olive Avenue to Peoria Avenue.

12.6 SERVICE INTERCHANGES

The typical service interchange as shown in the plans included in Chapter 15 is a tight diamond. However, since a SPUI will fit within the right-of-way set aside for a tight diamond interchange, the SPUI should be considered for those cross streets that warrant it. The current MAG 2030 traffic projections indicate that Bell Road may warrant a SPUI. It should be noted that land use planning along much of the corridor is now under way. As the corridor design advances to final design, the issue of interchange type should be revisited with the latest information available at that time.

The service interchanges will have one lane off-ramps that widen to three lanes as they approach the cross street. The three lanes will consist of a left-turn lane, a middle lane, and a right-turn lane. The middle lane would be an optional lane to be designated for each location based upon traffic estimates at the time of final design.

The on-ramps will have two lanes that taper to one lane near the gore. The standard ADOT two-lane on-ramp can accommodate ramp metering in the future as necessary.

12.7 I-10/SR 303L SYSTEM INTERCHANGE

The recommended configuration, as discussed in Chapter 10, is a five-level system interchange that includes two-lane, one-way frontage roads that run parallel on both sides of SR 303L and I-10 (Figure 12-1). The frontage roads and local streets will be at grade, and SR 303L will be depressed under McDowell Road and the frontage roads and slightly elevated over the RID canal, which will be enclosed in a concrete box culvert within the SR 303L right-of-way, as discussed in Section 12.14. I-10 will remain elevated, as it is currently, and there will be two levels of flyover ramps above I-10. The frontage roads will form split diamonds between Citrus Road and Sarival Avenue along I-10 and between Thomas Road and Van Buren Street along SR 303L.

The SR 303L alignment is at the mid-section line at Indian School Road and curves to the west as it moves southward to I-10. At I-10 the SR 303L alignment is west of the Cotton Lane section line and continues to be west of the section line to south of Van Buren Street.

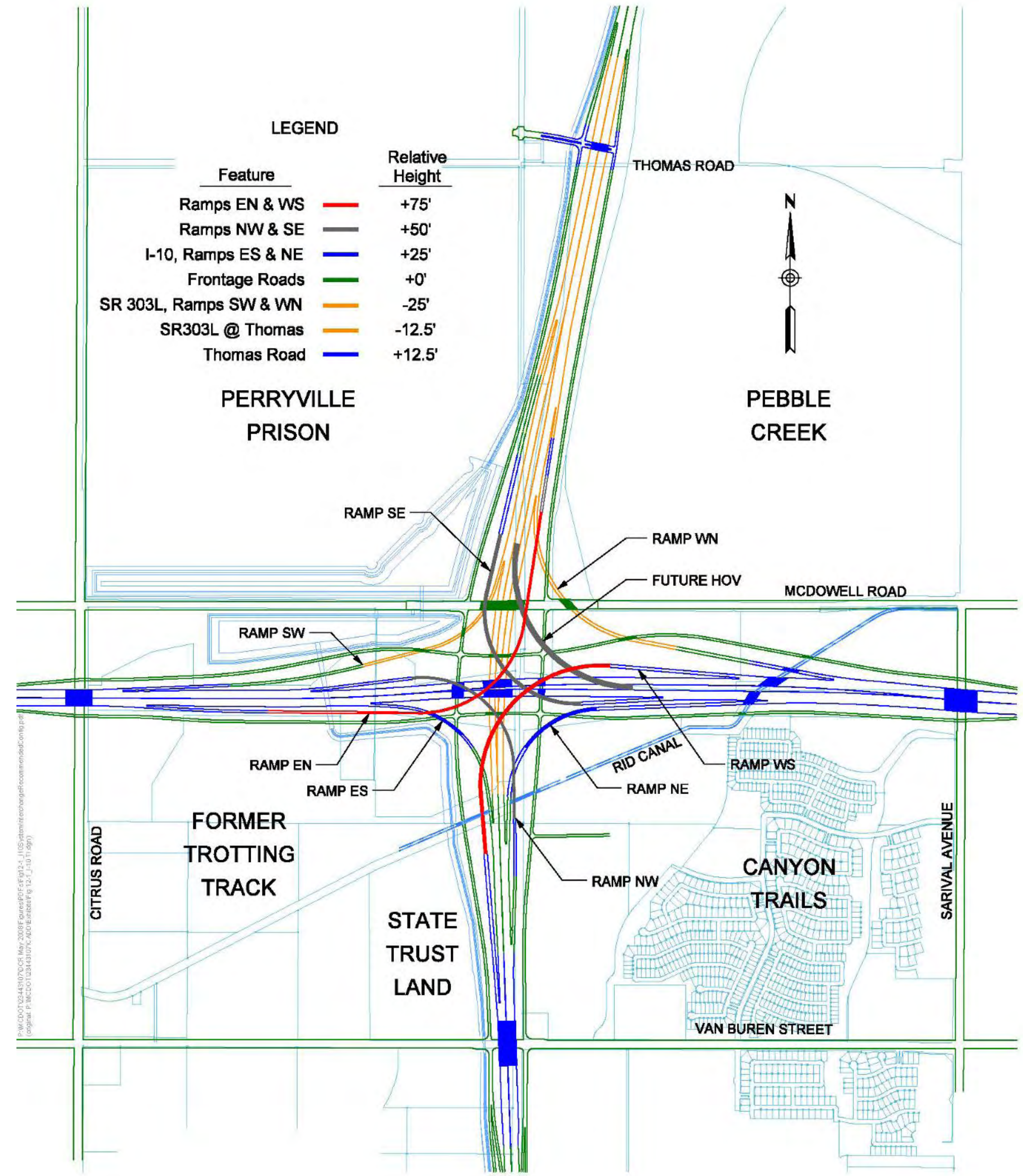

Figure 12-1 I-10/SR 303L System Interchange Recommended Configuration

I-10 will have to be realigned to the north to accommodate the SR 303L interchange. The realignment begins west of Citrus Road and reaches a maximum of approximately 250 feet just east of the SR 303L alignment centerline. The realignment continues eastward to a point east of Sarival Avenue. The existing southern right-of-way line for I-10 will be retained east of Cotton Lane to avoid encroachment on existing residential development.

It is important to recognize that I-10 needs to be realigned and widened prior to or concurrent with the construction of the SR 303L system interchange. Funds for the I-10 widening are programmed separately from the funds for SR 303L.

I-10 will need to be widened beyond the above-mentioned realignment to accommodate the system interchange at SR 303L. Traffic forecasts for 2030 indicate that the ramps will need to have two lanes on the east side of the interchange and one lane on the west side. During the interchange development, ADOT commented that the two outside mainline lanes approaching two-lane off-ramps should exit the mainline with the ramp to increase the decision time for the motorist. ADOT also commented that I-10 should have four general purpose lanes and one HOV lane in each direction through the core of the interchange. This will require that I-10 have eight general purpose and one HOV lane westbound approaching the interchange, and since the on-ramps will enter the freeway with their own lanes, the same number of lanes will be needed eastbound departing the interchange. The extra three lanes will be added between SR 303L and Bullard Avenue.

The geometry of the system interchange was refined to ensure adequate vertical clearance and stopping sight distance requirements and to minimize retaining walls. The main effect of this refinement was to “spread” the interchange out along I-10 and SR 303L. Ramps were lengthened to meet vertical clearance requirements and maintain reasonable longitudinal slopes. Vertical clearance requirements were determined using ADOT standards for vertical clearances to finished structures and falsework. New ADOT standards require 16 feet of clearance to falsework for bridges constructed over traffic. The vertical clearance requirement to the finished structure remains unchanged at 16.5 feet. Profiles of ramps that could logically be constructed over existing traffic were designed with additional clearances to accommodate falsework, such as those that are one level above I-10 and the frontage roads. Profiles for flyovers two levels above I-10 (ramps EN and WS) or bridges over depressed roadways were not adjusted for falsework because they could be built without traffic underneath.

The westbound frontage road was shifted farther north to eliminate the need for retaining walls adjacent to the ramps. The intersections of the westbound frontage road with the northbound and southbound frontage roads were kept approximately 600 feet away from McDowell Road/ frontage road intersections for operational reasons. The eastbound frontage road could not be shifted to the south due to the proximity of the RID canal and the residential properties in the southeast quadrant. The frontage road needed to be as close as possible to I-10 to allow SR 303L room to be depressed under the frontage road and elevated over the RID canal.

The RID canal crosses I-10 east of the interchange. The planned realigned freeway, ramps and frontage roads would cross the canal via bridges, without relocating the canal. Off-site drainage flows on the north side of the RID canal would also be accommodated by the planned bridges.

A change of access report was prepared and submitted to FHWA for the I-10/SR 303L system interchange. During the preparation and review of that report, two modifications were made. The eastbound off-ramp to Estrella Parkway will have two lanes, one from the auxiliary lane and an option off from the outside lane. This modification will aid eastbound motorists traveling through the core of the system interchange to be able to move across the incoming traffic from SR 303L ramps and be able to exit at Estrella Parkway.

The second change was made to add a fourth westbound lane west of SR 303L. The reconstruction that is currently in design will provide three through lanes in each direction on an urban freeway section with a median barrier. Permanent construction will begin at Citrus Road and extend westward to Verrado Way. Some of the existing roadbed will remain in place but will be outside the travelway. For a relatively minor cost, ADOT can rehabilitate and pave the unused roadbed as a fourth westbound lane. The fourth lane will greatly improve the traffic operations based on the 2030 traffic forecast. The cost of this additional lane has not be included in this DCR.

12.8 US 60/SR 303L INTERCHANGE

The recommended configuration is a three-level stacked single point urban interchange that consists of US 60 at grade, SR 303L elevated over US 60 and the left turn ramps depressed under US 60 (Figure 12-2). A two-phase traffic signal will be needed at the intersection of the ramps. Careful consideration will be needed in the design of the placement of the signal heads and the ramp geometry to optimize visibility of the traffic signals.

The southbound SR 303L bridge over US 60 was constructed as part of MCDOT’s interim construction of SR 303L, and the northbound bridge will be constructed as part of the ultimate freeway. The northbound alignment was shifted 12 feet to the east in order to accommodate the existing southbound bridge. Piers for the new bridge will be placed in BNSF right-of-way. In consultation with BNSF during the preparation of the design concept revealed that the railroad desired to maintain 100 feet clear distance centered on the existing track. Due to the ramp geometry, the middle bridge pier is proposed to be placed so that there would be 92 feet clear distance between this new pier and the existing north pier for the existing bridge. BNSF staff indicated acceptance of this configuration.

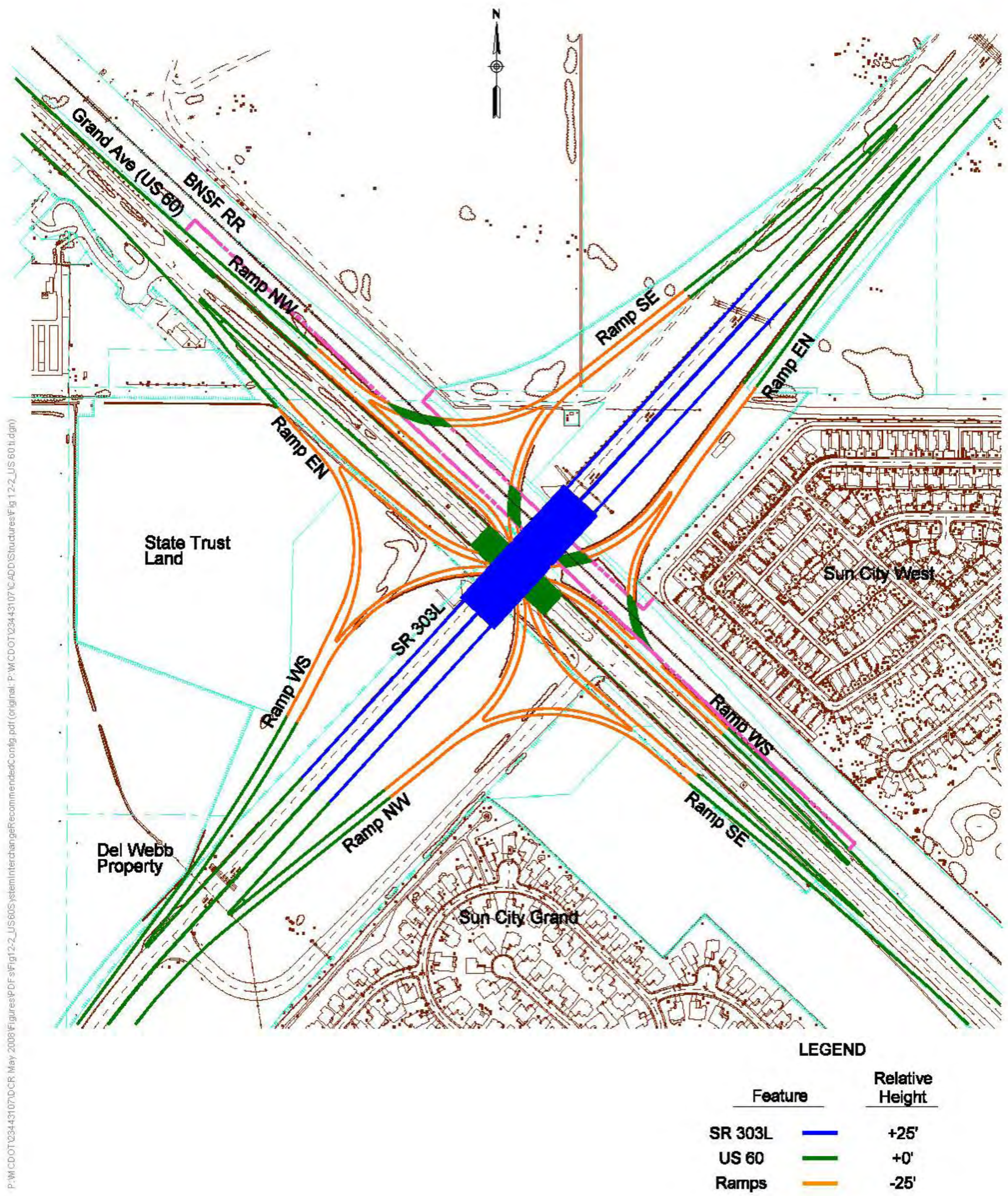

Figure 12-2 US 60/SR 303L Interchange Recommended Configuration

As part of the refinement of the recommended alternative, Ramp ES was revised to avoid impacting the Del Webb property adjacent to the freeway on the west side. The ramp alignment was placed closer to the mainline and slightly shortened. A retaining wall will be needed near the right-of-way line.

A full take of the properties will be needed in the west quadrant of the interchange because the ramp configuration eliminates access to these properties. The properties consist of an Arizona State Trust land parcel and some privately owned land south of US 60 and just below the McMicken Dam channel. As the project development process continues, consideration should be given to providing access to these properties via a new road constructed across the flood channel and the Beardsley Canal.

Private property located in the south quadrant south of US 60 and east of SR 303 will also be land locked by the proposed interchange. Some of this land is proposed to be used for a pump station, detention basin and outfall pipe. A total take of the property is expected.

US 60 is planned to be widened to six lanes. Construction of the SR 303L ramps will require additional widening east and west of the planned freeway for a total distance of approximately 6,800 feet. The US 60 structures over the Beardsley Canal and the McMicken Dam outfall will also require widening or replacement. The cost has been included in Chapter 14.

12.9 NORTHERN PARKWAY/SR 303L SYSTEM INTERCHANGE

The recommended configuration is a three-level, fully directional system interchange

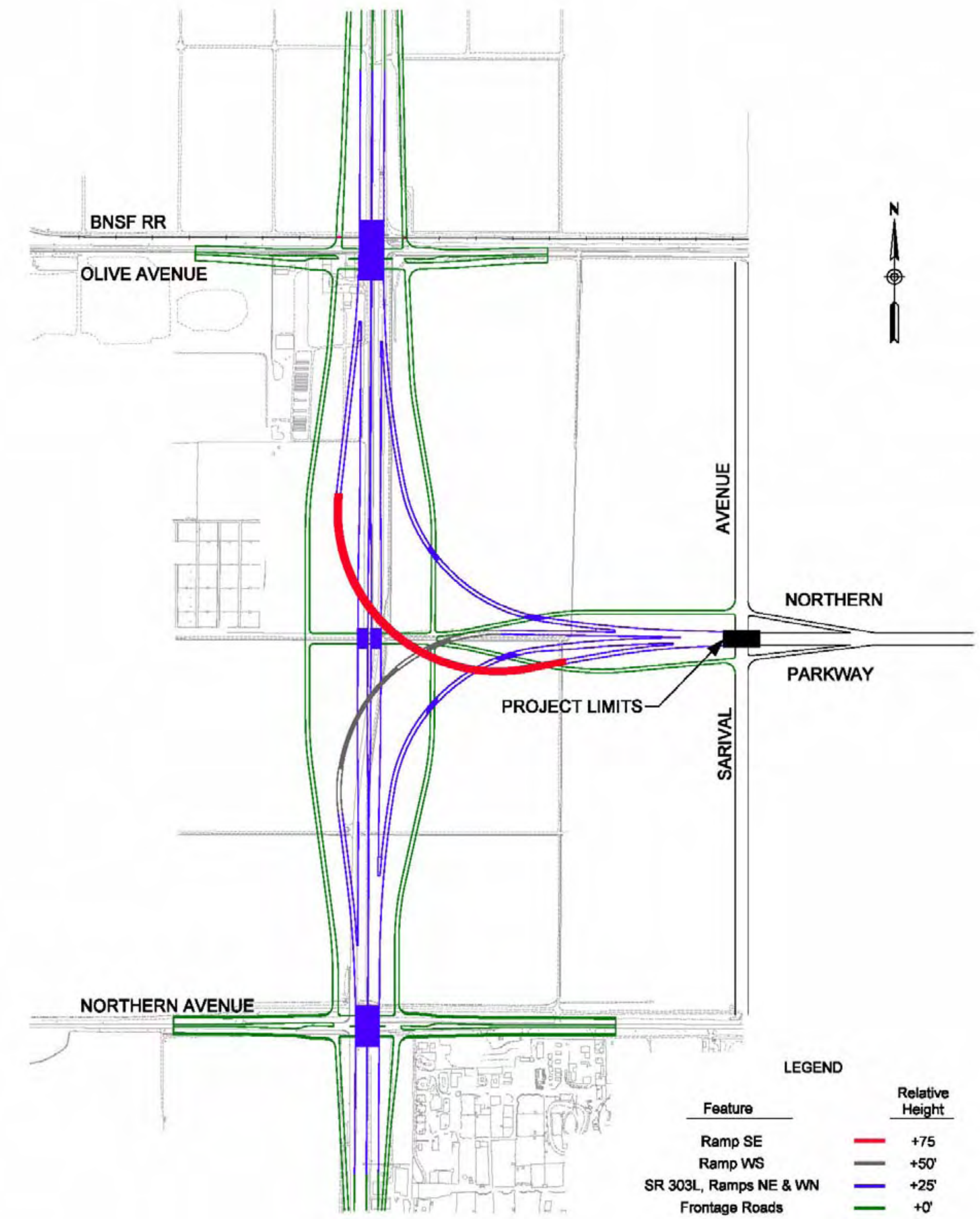

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Figure 12-3). As Northern Parkway approaches SR 303L from the east, it will be elevated over Sarival Avenue. System ramps will connect the freeway with Northern Parkway. The ramps on the north side of the Northern Avenue interchange and the south side of the Olive Avenue interchange would be eliminated to allow for the system ramps. Instead, two-lane, one-way frontage roads would connect Northern and Peoria avenues on both sides of SR 303L, forming a split diamond. Ramps on the north side of Olive Avenue have been replaced with frontage roads because ramps cannot cross the railroad at grade.

The Northern Parkway/SR 303 ramps are assumed to be part of the SR 303L project. The ramps extend eastward to, but do not include, the Northern Parkway structures over Sarival Avenue.

Some modifications to the interchange have been suggested. Refer to Section 12.25.

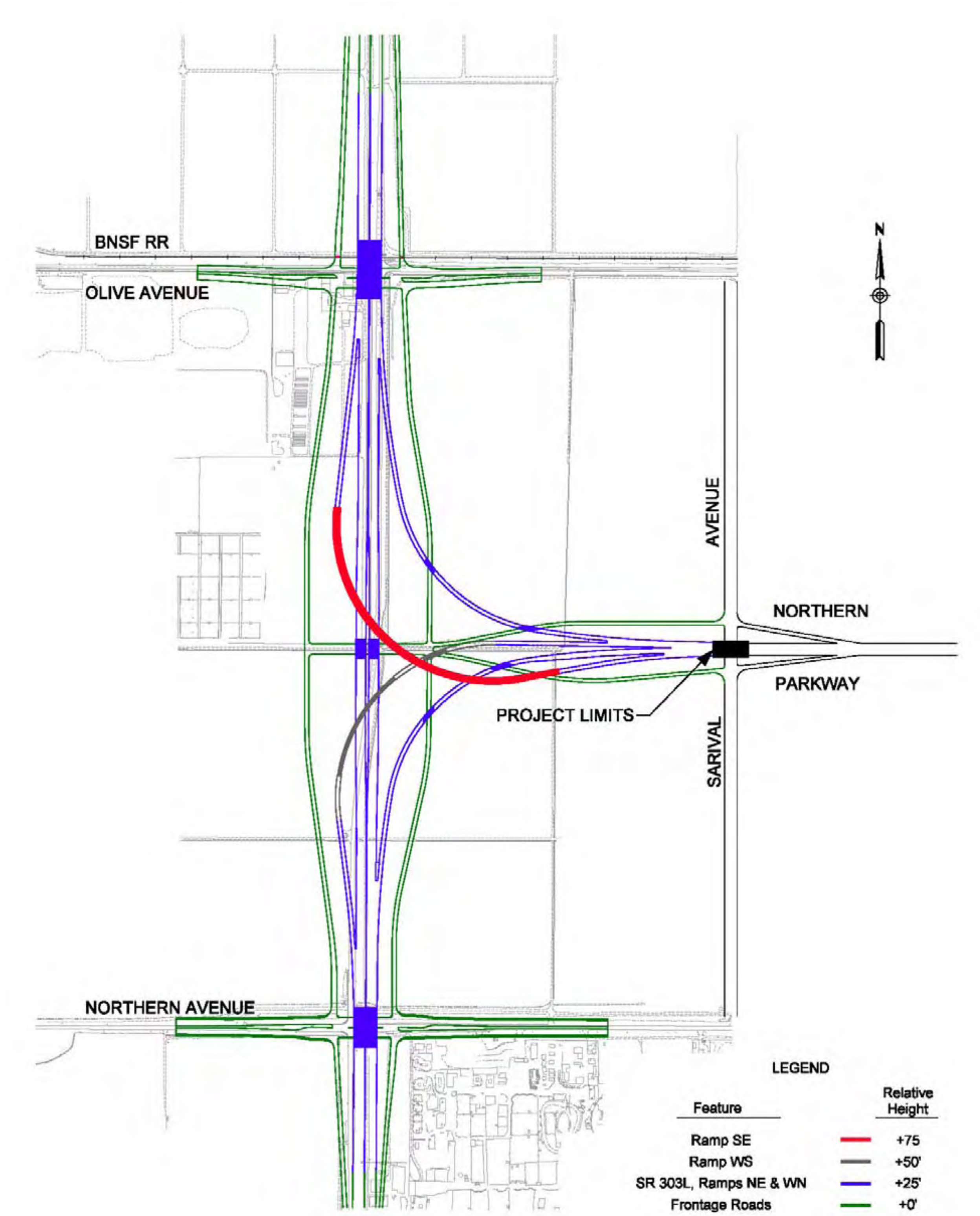

Figure 12-3 Northern Parkway/SR 303L System Interchange Recommended Configuration

12.10 STRUCTURES

This section addresses the engineering evaluation performed to determine the preliminary location, functional structure type, span configuration, and approximate length of the new structures along this corridor. The major structures were grouped into the following five locations:

1. System Traffic Interchange (TI) at SR 303L and I-10
2. 12 Underpasses or Overpasses at section line roads
3. System TI at SR 303L and Northern Parkway
4. System TI at SR 303L and US 60
5. Regional off-site drainage system (ADMP) channel crossing structures

The bridge structures section has been prepared in two sections: the Bridge Superstructure and the Bridge Substructure.

12.10.1 Bridge Superstructure

I-10 System Interchange

The system interchange will be a five level interchange located at the intersection of the proposed SR 303L and the existing I-10 (see Figure 12-4). The interchange is laid out with a total of 25 separate bridge structures. A summary is provided below:

Structures at ground level include: (1) SR 303L under McDowell; (2) Ramp WN under McDowell Road; (3) Ramp WN under NB frontage road; (4) Ramp WN under WB frontage road; (5) Ramp SW under SB frontage road; (6) Ramp SW under WB frontage road; (7) SR 303L under WB frontage road; (8) SR 303L under EB frontage road; (9) WB frontage road over RID canal; and (10) EB frontage road over RID canal.

Structures at level one above ground include: (11) I-10 WB over SB frontage road; (12) I-10 EB over SB frontage road; (13) I-10 WB over SR 303L; (14) I-10 EB over SR 303L; (15) I-10 WB over NB frontage road; (16) I-10 EB over NB frontage road; (17) Ramp ES over EB and SB frontage roads; (18) Ramp NE viaduct; (19) Ramp NE over RID canal; (20) I-10 EB over RID canal; (21) I-10 WB over RID canal; and (22) Ramp WN over RID canal.

Structures at the second level above ground include: (23) Ramp SE viaduct; and (24) Ramp NW viaduct.

Structures at the third level above ground include: (25) Ramp EN viaduct; and (26) Ramp WS viaduct.

Additional structures near but not directly part of the I-10 system interchange include I-10 overpasses at Citrus Road, Sarival Avenue, and Estrella Parkway.

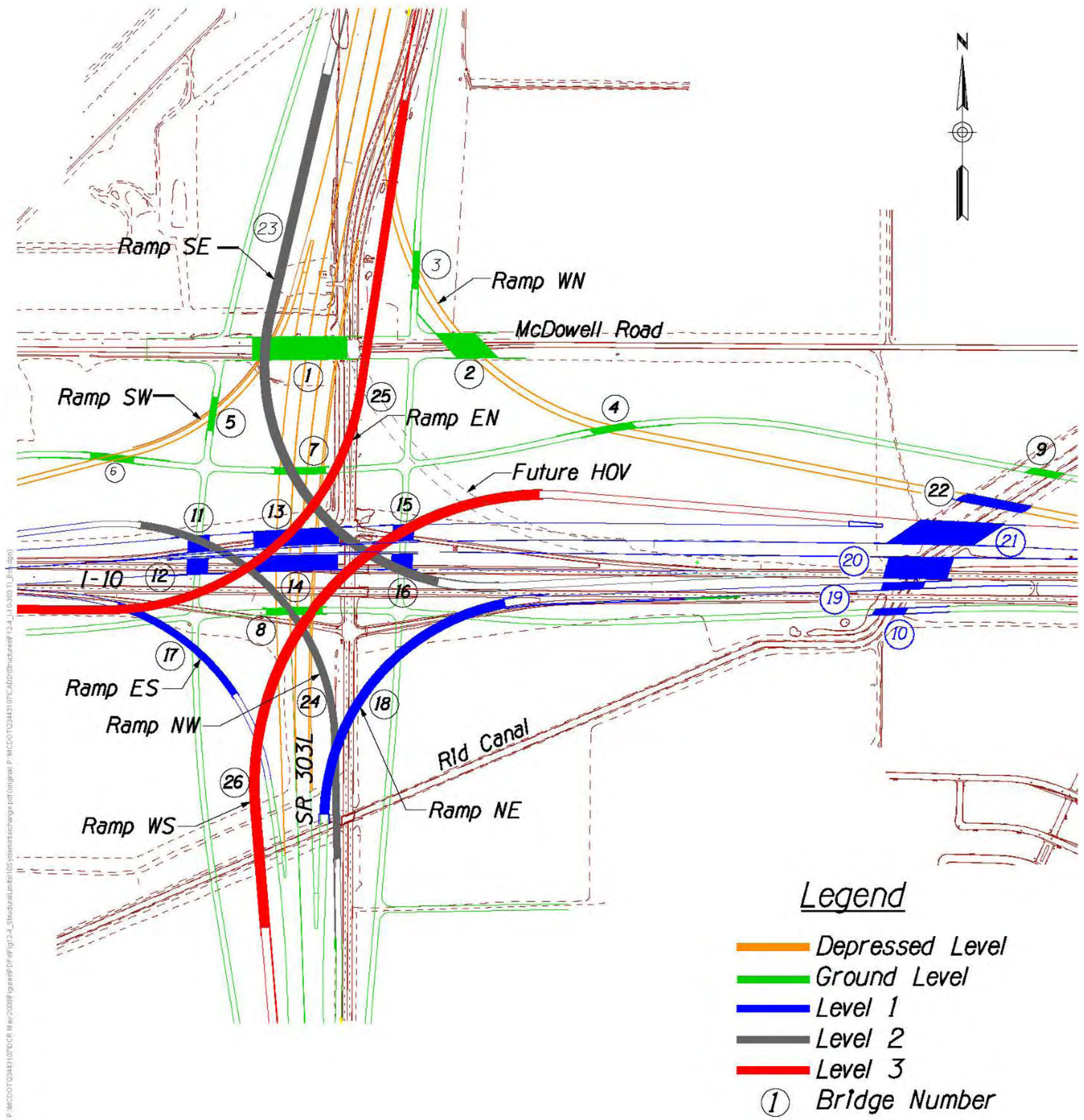

Figure 12-4 Structural Limits I-10/SR 303L System Interchange

The SR 303L underpass at Van Buren Street would be part of SR 303L but not part of the I-10 system interchange. The box structure for the RID canal to pass under SR 303L and the north- and southbound frontage roads is described in Section 12.14.

The I-10/SR 303L ramps on the west side of SR 303L are shown in this DCR as one-lane ramps based upon the 2030 traffic forecast provided by MAG. With the potential for extension of SR 303L to the south and the growth potential west of SR 303L, ADOT is considering constructing the embankment and structures for two-lane ramps.

Basic elevations and cross sections of the bridges are shown in Figure 12-5 through Figure 12-12. Table 12-3 provides a summary of the structures in the I-10 system interchange.

Table 12-3 I-10/SR 303L System Interchange

Structure No.	Structure Location	Ramp/ Underpass/ Overpass	Structure Profile	Number of Spans	Width (feet)	Length (feet)
1	McDowell Rd over SR 303L	Underpass	Ground Level	3	126.00	468.00
2	McDowell Rd over Ramp WN	Underpass	Ground Level	1	138.00	198.00
3	NB Frontage Rd over Ramp WN	Underpass	Ground Level	1	35.17	185.00
4	WB Frontage Rd over Ramp WN	Underpass	Ground Level	1	35.17	209.00
5	SB Frontage Rd over Ramp SW	Underpass	Ground Level	1	35.17	166.00
6	WB Frontage Rd over Ramp SW	Underpass	Ground Level	1	35.17	212.00
7	WB Frontage Rd over SR 303L	Underpass	Ground Level	2	35.17	250.00
8	EB Frontage Rd over SR 303L	Underpass	Ground Level	2	35.17	276.00
9	WB Frontage Rd over RID Canal	Overpass	Ground Level	3	35.17	154.50
10	EB Frontage Rd over RID Canal	Overpass	Ground Level	1	35.17	154.50
11	WB I-10 over SB Frontage Rd	Overpass	Level 1	1	87.17	104.50
12	EB I-10 over SB Frontage Rd	Overpass	Level 1	1	87.17	104.50
13	WB I-10 over SR 303L	Overpass	Level 1	2	87.17	416.00
14	EB I-10 over SR 303L	Overpass	Level 1	2	87.17	416.00
15	WB I-10 over NB Frontage Rd	Overpass	Level 1	1	87.17	104.50
16	EB I-10 over NB Frontage Rd	Overpass	Level 1	1	87.17	104.50
17	Ramp ES	Ramp	Level 1	6	31.17**	730.00
18	Ramp NE	Ramp	Level 1	5	43.17	910.00
19	Ramp NE over RID Canal	Ramp	Level 1	3	43.17	304.50
20	EB10 over RID Canal	Overpass	Level 1	3	60.00	304.50
21	WB10 over RID Canal	Overpass	Level 1	3	12.00	304.50
22	WN over RID Canal	Overpass	Level 1	3	39.17	304.50
23	Ramp SE	Ramp	Level 2	15	43.17	2948.00
24	Ramp NW	Ramp	Level 2	11	31.17**	2148.00
25	Ramp EN	Ramp	Level 3	25	31.17**	5120.00
26	Ramp WS	Ramp	Level 3	15	43.17	2923.00
*	WB I-10 over Sarival Ave	Overpass	Level 1	2	36.00	170.00
*	EB I-10 over Sarival Ave	Overpass	Level 1	2	36.00	170.00
*	WB I-10 over Estrella Pkwy	Overpass	Level 1	2	12.00	185.00
*	EB I-10 over Estrella Pkwy	Overpass	Level 1	2	12.00	185.00

*These structures lie immediately outside the boundaries of Figure 12-4 and thus have not been numbered.
**ADOT may build these structures to accommodate two lanes.

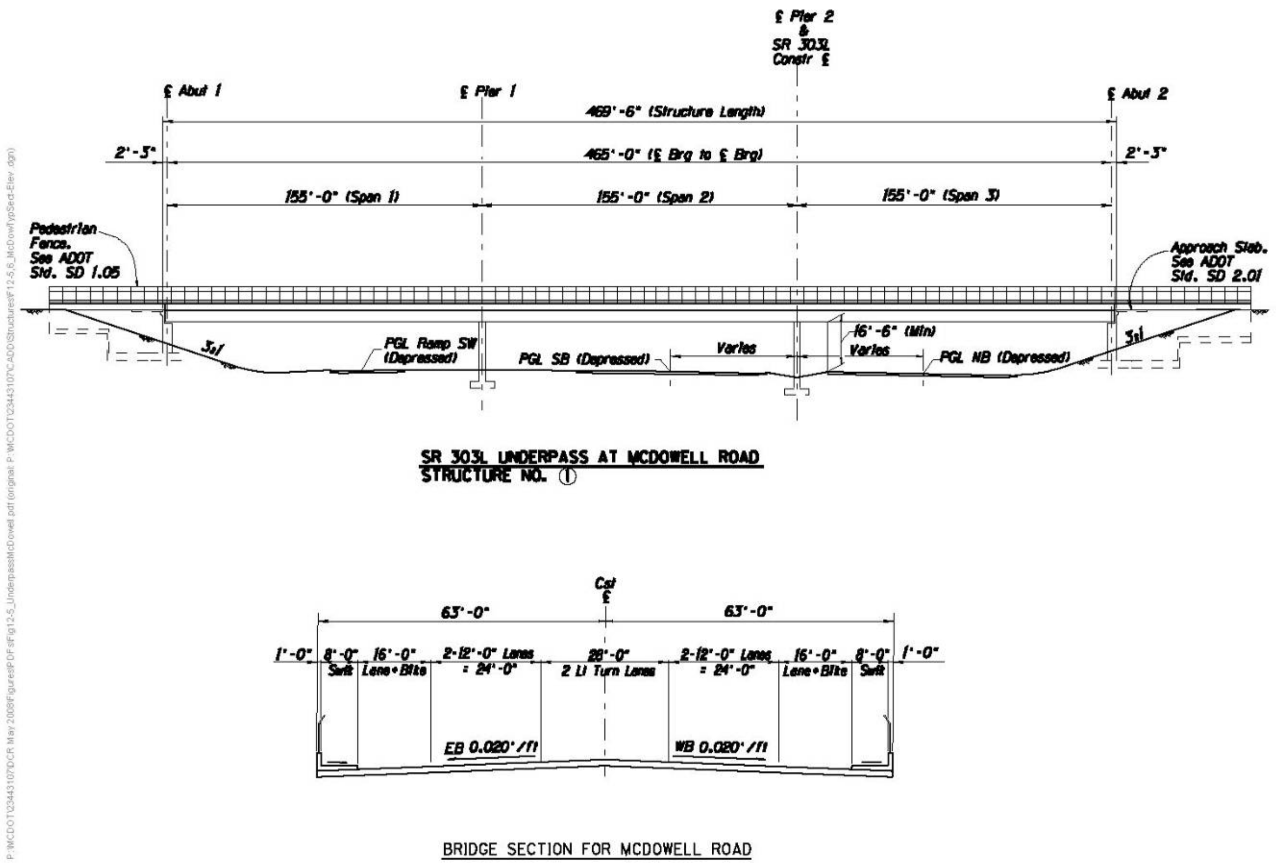

Figure 12-5 SR 303L Underpass at McDowell Road

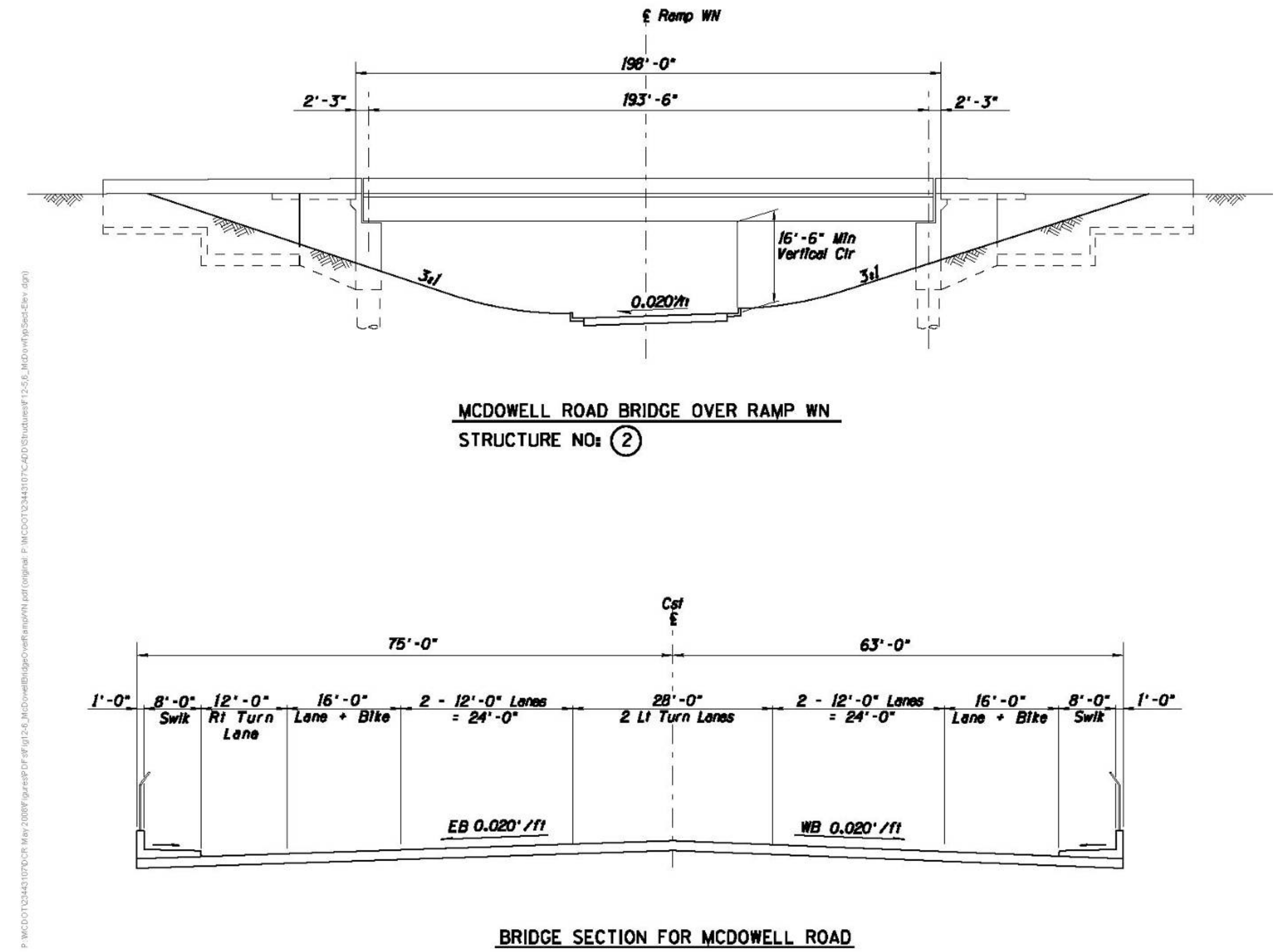

Figure 12-6 McDowell Road Bridge Over Ramp WN

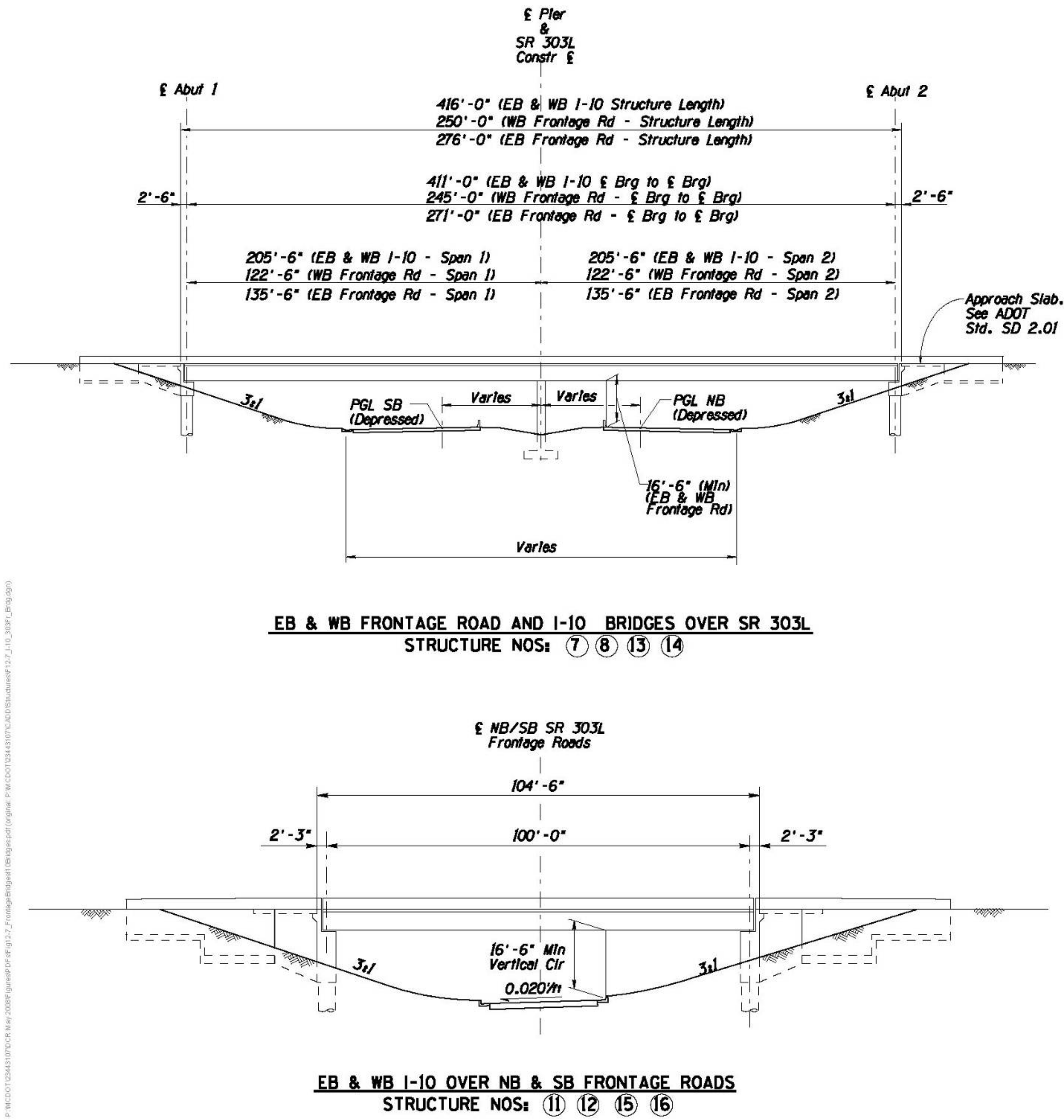

Figure 12-7 Frontage Road Bridges and I-10 Bridges Over SR 303L and Frontage Roads

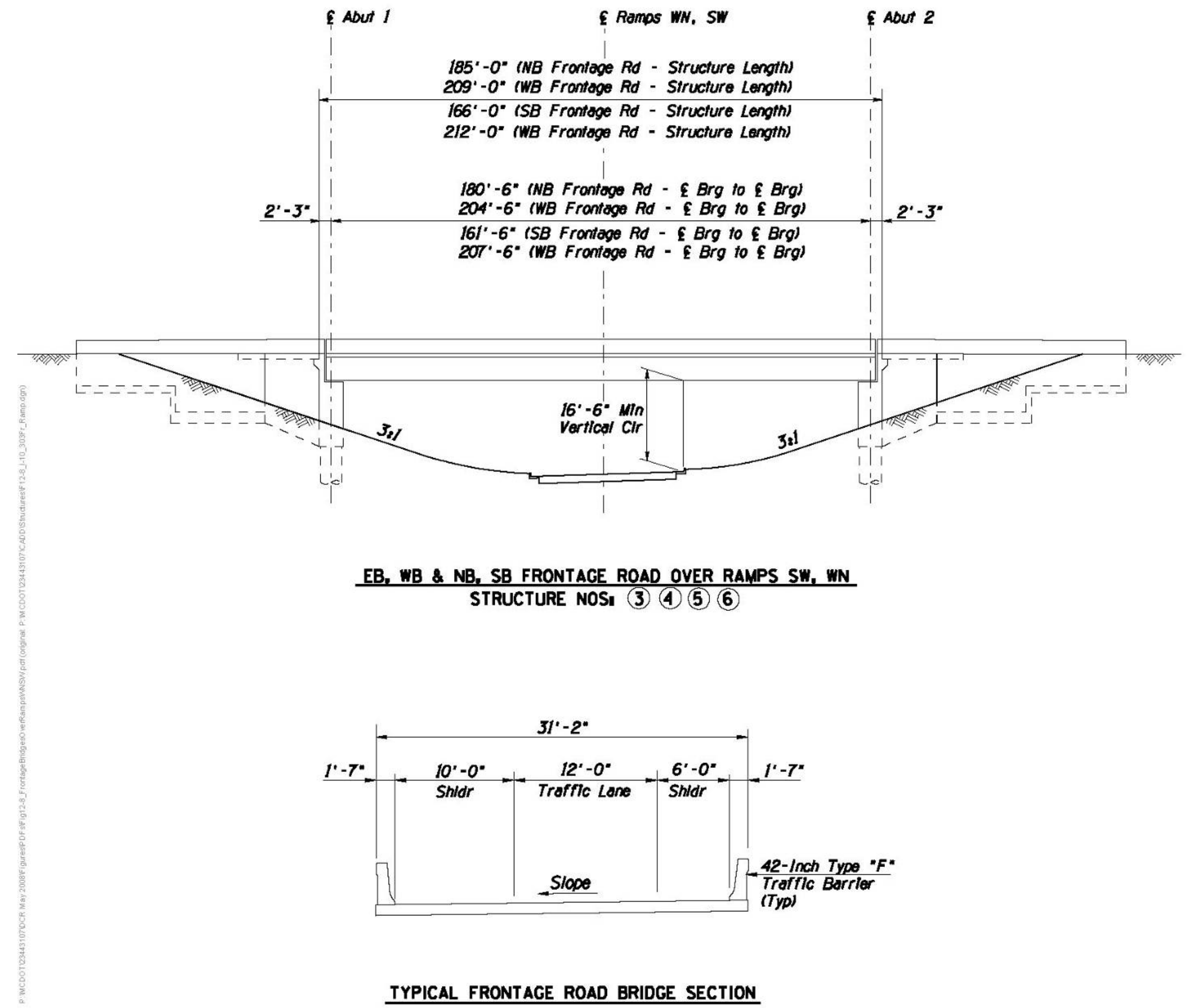

Figure 12-8 Frontage Road Bridges Over Ramps WN and SW

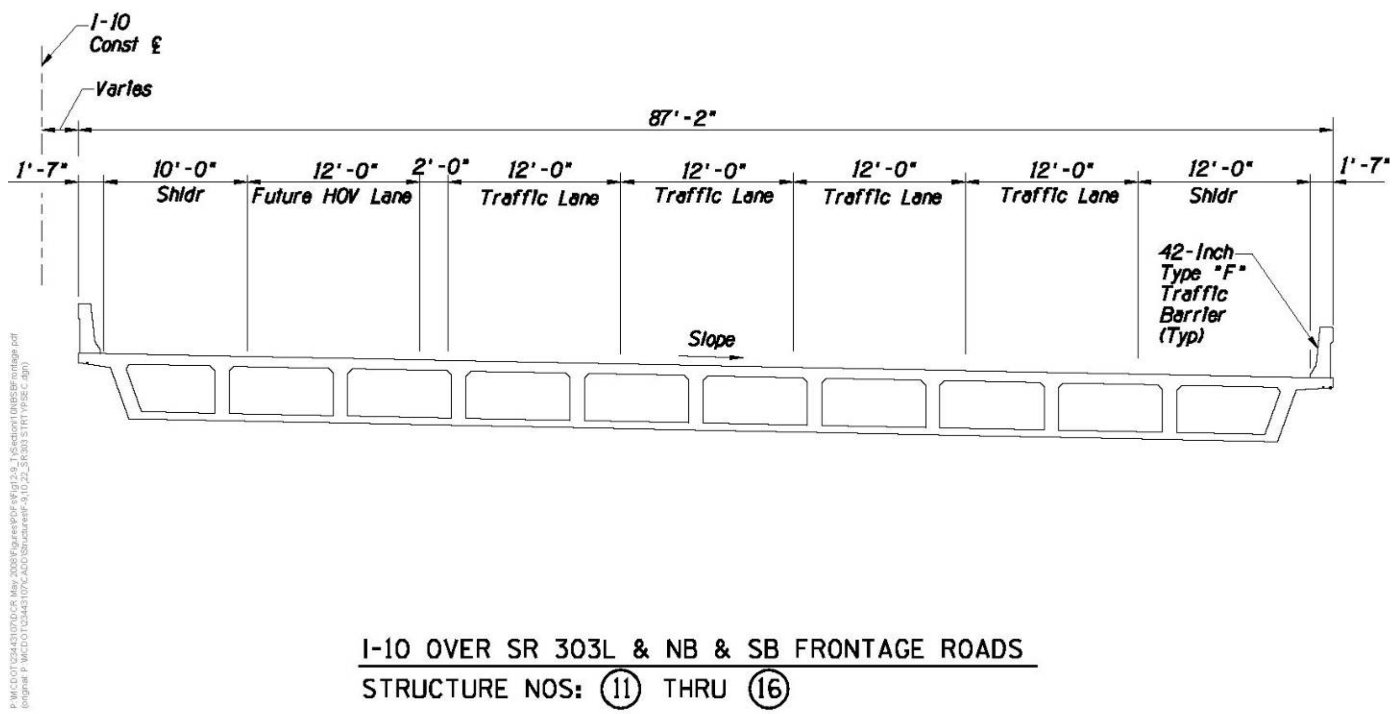

Figure 12-9 Typical Section for I-10 Over SR 303L, NB & SB Frontage Roads

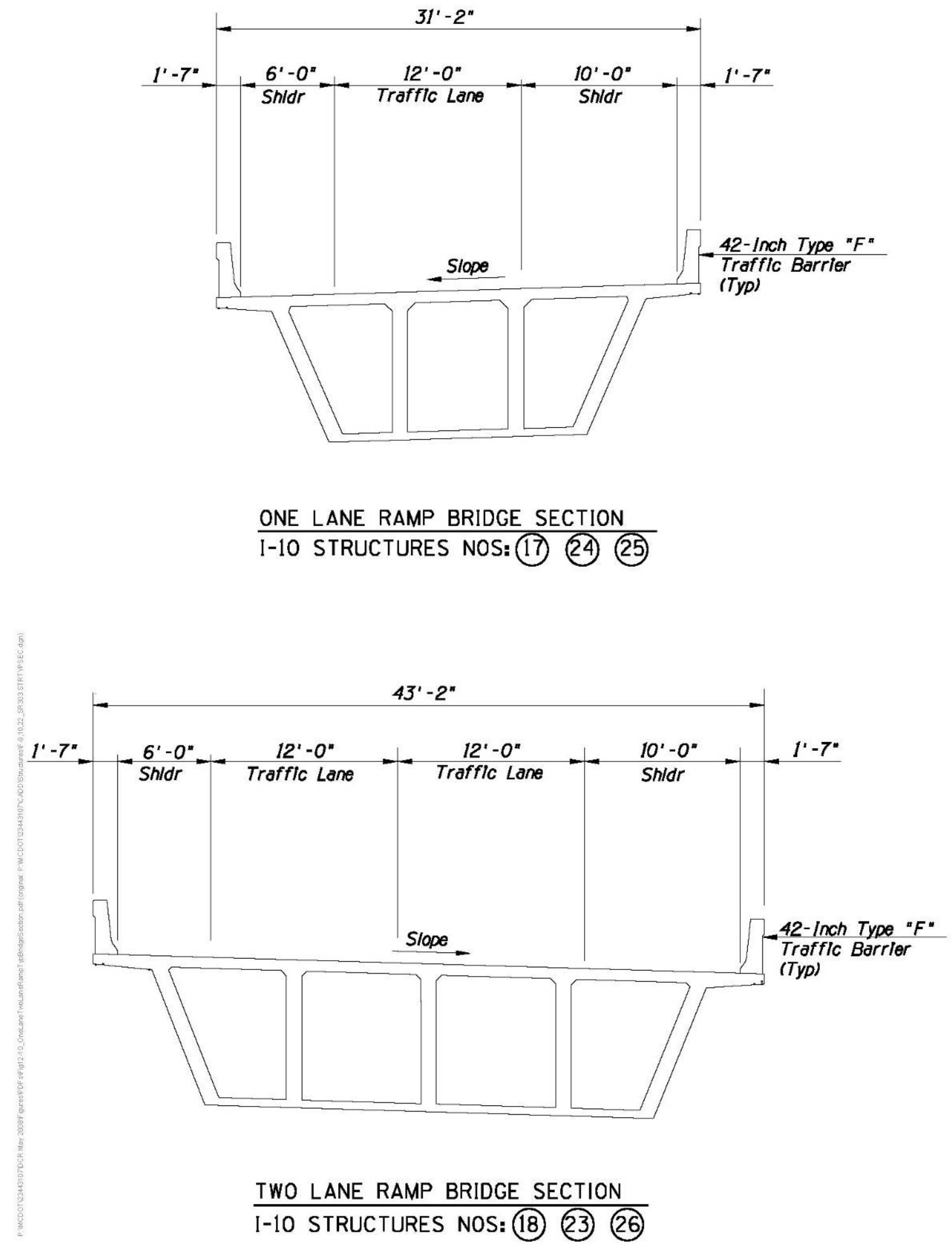

Figure 12-10 One-Lane and Two-Lane Ramp Typical Bridge Section

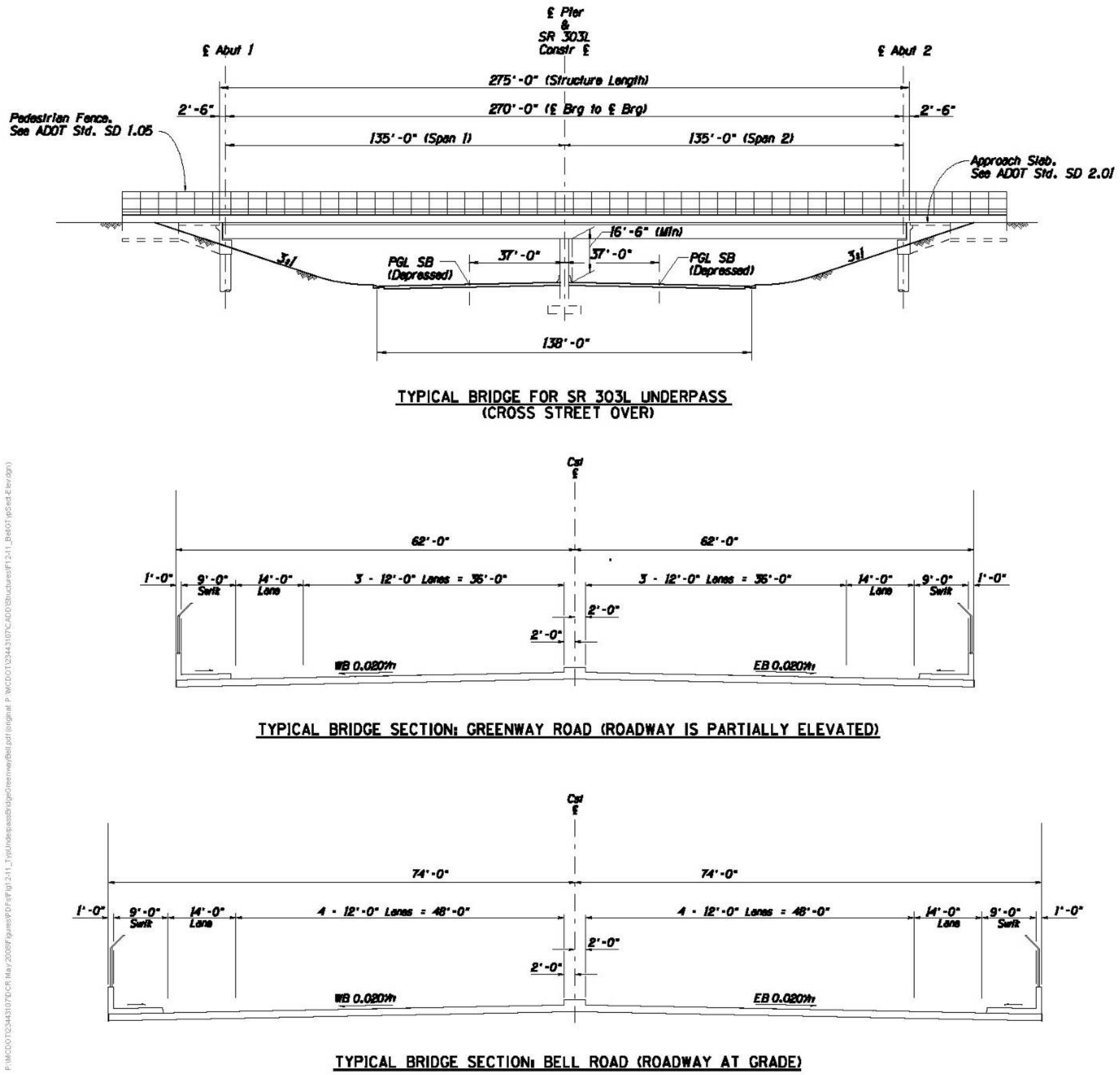

Figure 12-11 Typical Underpass Bridge for SR 303L at Greenway Road and Bell Road

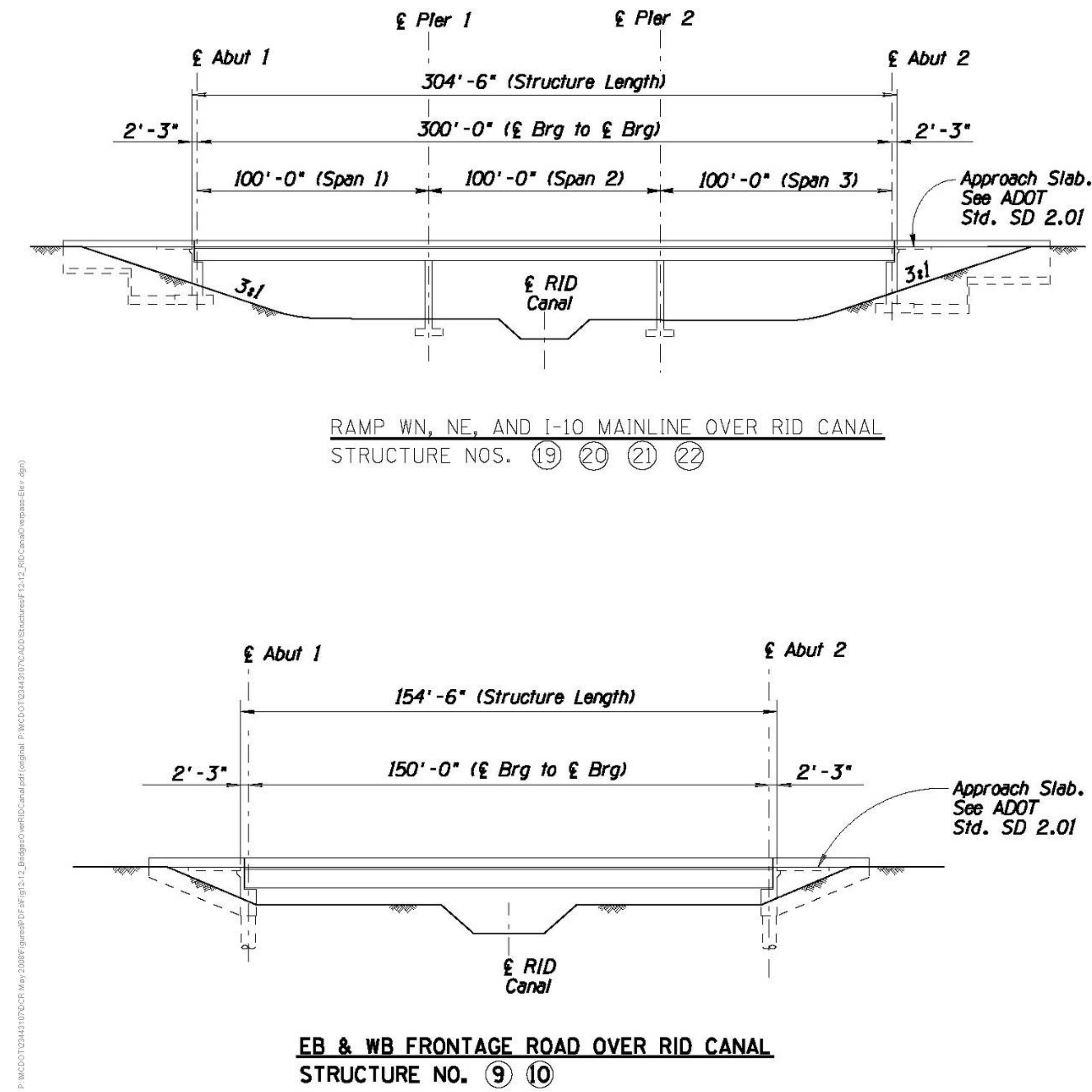

Figure 12-12 Bridges Over the RID Canal

The common type of superstructure for ramp structures is a multi-span cast-in-place post-tensioned concrete box girder, mainly because of the curved geometry and longer spans. Conventional precast-prestressed girders cannot have spans exceeding 140 feet, therefore cast-in-place post-tensioned concrete box girders or steel plate girders bridges are the potential choices for the ramp structures. Since the cost of steel bridges in Arizona tends to be very high, the cast-in-place concrete box is the likely choice.

Ramps NW, EN and ES are single lane traffic structures with a total width of 31 feet, 2 inches and Ramps NE, SE and WS are two-lane traffic structures with a total width of 43 feet, 2 inches. All ramps will have 42-inch Type “F” traffic barriers (see Figure 12-10).

Due to the tightly woven geometry of the interchange, straddle bent piers (see Figure 12-13) may be required; however, they should be used sparingly because of their high cost. In our preliminary span configurations for each ramp structure there is only one straddle bent required for Ramp EN over Ramp WN. In the future, when the HOV Ramp is constructed 4 additional straddle bents will be required.

Underpasses and Overpasses at Section Line Roads

New bridges will be required at each grade-separated intersection for SR 303L from Thomas Road to Bell Road. With the exception of the underpasses at McDowell Road, Thomas Road, Greenway Road, and Bell Road, all grade separation structures will be overpasses (SR 303L elevated with the cross street passing under the freeway). Along I-10, all grade separation structures will be overpasses where the arterial roads will remain at existing grade

The overpass structures consist of constructing the main corridor above the arterial streets that are to remain at grade. The underpass structures consist of constructing the main corridor below and the arterial streets above. With the exception of Bell Road, all the underpasses will have SR 303L fully or partially depressed with the cross street elevated over the freeway.

All underpass structures along SR 303L are planned to have two spans that will include the ultimate typical section for SR 303L with the future HOV lanes and 3:1 slopes (3 horizontal and 1 vertical). In addition, the underpass structure can be either cast-in-place post-tensioned concrete box girders or precast-prestressed concrete I-girders. A discussion of the McDowell Road underpass is included in Section 12.7. The Thomas Road underpass is shown in Figure 12-14.

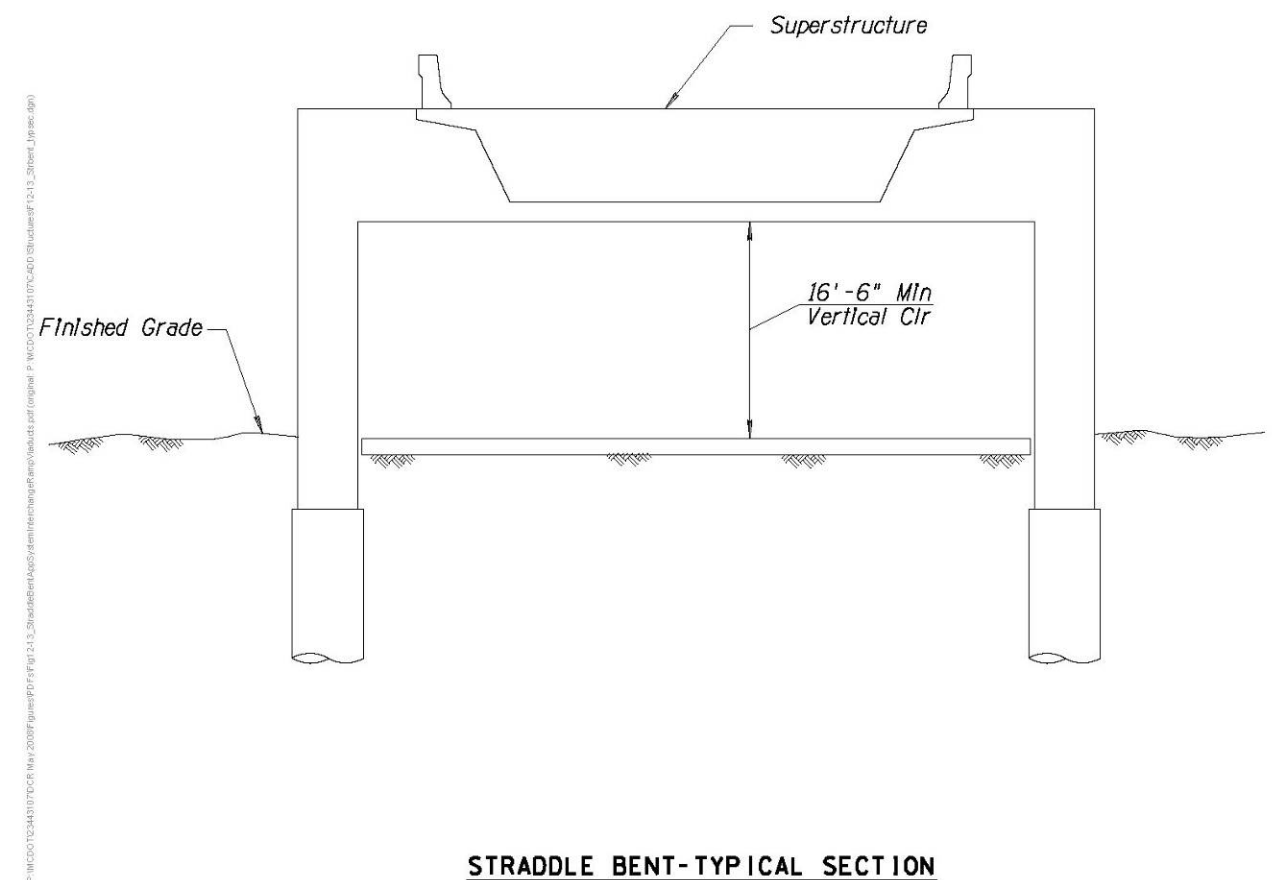

Figure 12-13 Potential Straddle Bent Application on System Interchange Ramp Viaducts

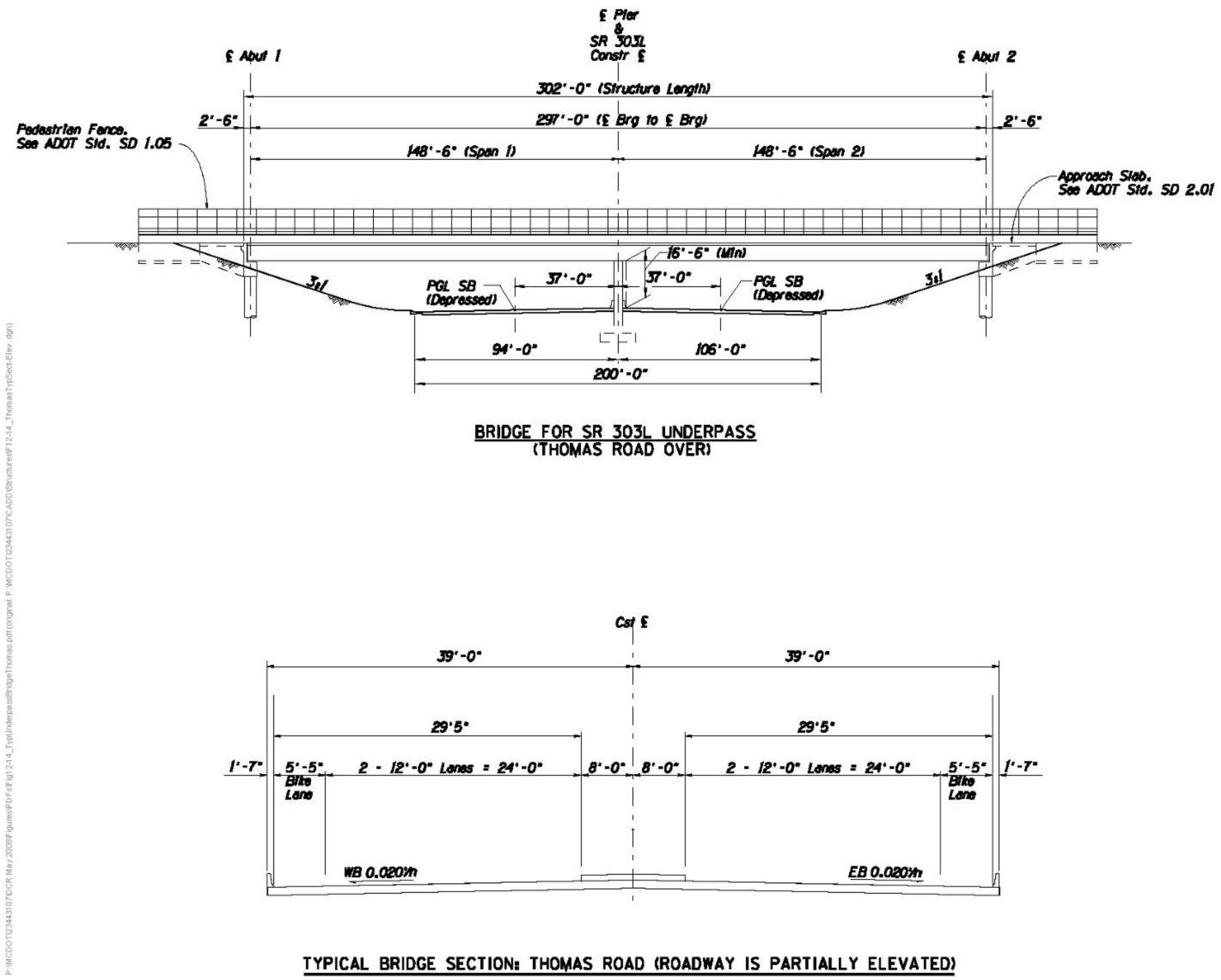

Figure 12-14 Typical Underpass Bridge for SR 303L at Thomas Road

There are nine overpasses along SR 303L. The most typical structure is shown in Figure 12-15. Special sections are shown for Camelback Road Overpass, Northern Avenue Overpass (Figure 12-16), and Olive Avenue Overpass (Figure 12-17). To accommodate future lanes, the overpass structures have been laid out to the ultimate lengths and widths to avoid costly bridge reconstruction. Abutment embankments at these locations will have 2:1 slopes with slope paving to reduce span lengths and wingwalls. For all overpass structures the superstructure can be either cast-in-place post-tensioned concrete box girder or a precast-prestressed concrete I-girder, except at Olive Avenue where the third span over the railroad must be precast.

Table 12-4 provides a summary of the underpasses and the overpasses from Thomas to Bell Road.

Table 12-4 SR 303L: Thomas Road to Bell Road

Structure Location	Underpass/ Overpass	Number of Spans	Width (feet-inches) †	Length (feet) ††
Thomas Road over SR 303L	Underpass	2	78-0	302.00
SR 303L over Indian School Road	Overpass	2	61-2*	225.00
SR 303L over Camelback Road	Overpass	2	61-2*	225.00
SR 303L over Bethany Home Road	Overpass	2	61-2*	225.00
SR 303L over Glendale Avenue	Overpass	2	61-2*	225.00
SR 303L over Northern Avenue	Overpass	2	65-2*	225.00
SR 303L over Olive Avenue/BNSF Railroad	Overpass	3	61-2*	315.00
SR 303L over Peoria Avenue	Overpass	2	61-2*	225.00
SR 303L over Cactus Road	Overpass	2	61-2*	225.00
SR 303L over Waddell	Overpass	2	61-2*	225.00
Greenway Road over SR 303L	Underpass	2	124-0	275.00
Bell Road over SR 303L	Underpass	2	148-0	275.00

* One direction on SR 303L, initial construction three lanes each direction.
† Dimension is out to out
†† Dimension is from back of abutment to back of abutment

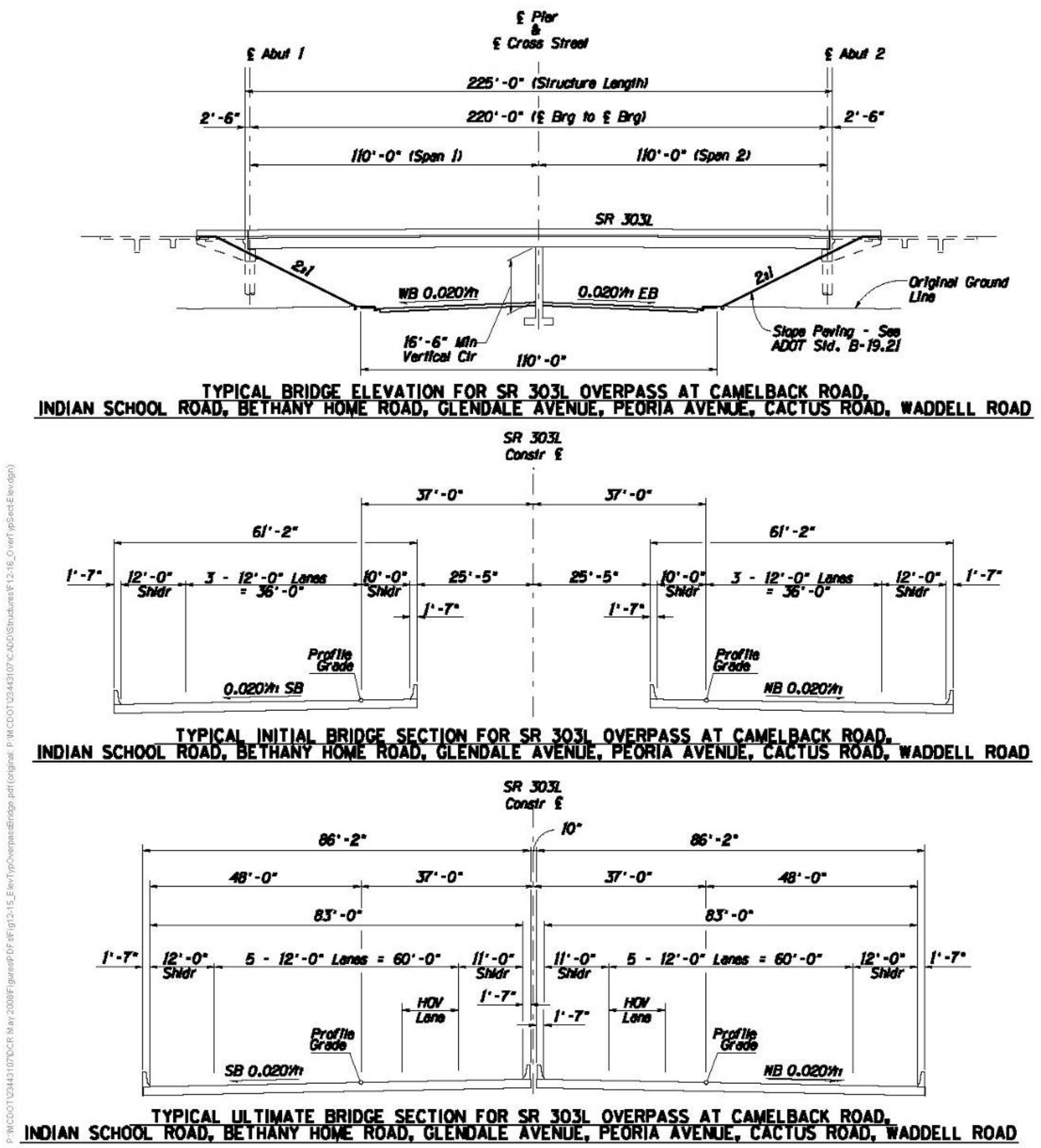

Figure 12-15 Elevation and Typical Overpass Bridge for SR 303L

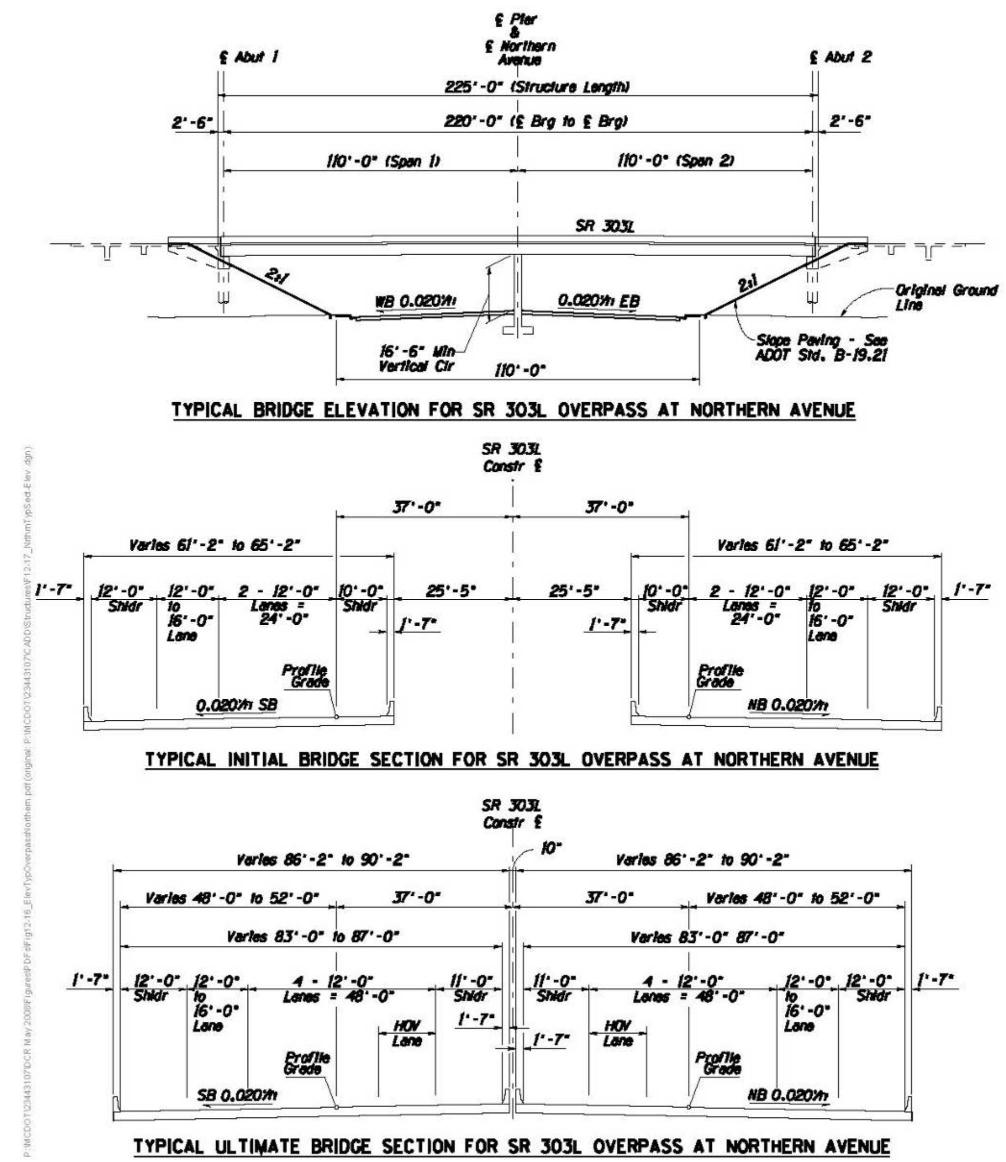

Figure 12-16 Elevation and Typical Section – SR 303L Overpass at Northern Avenue

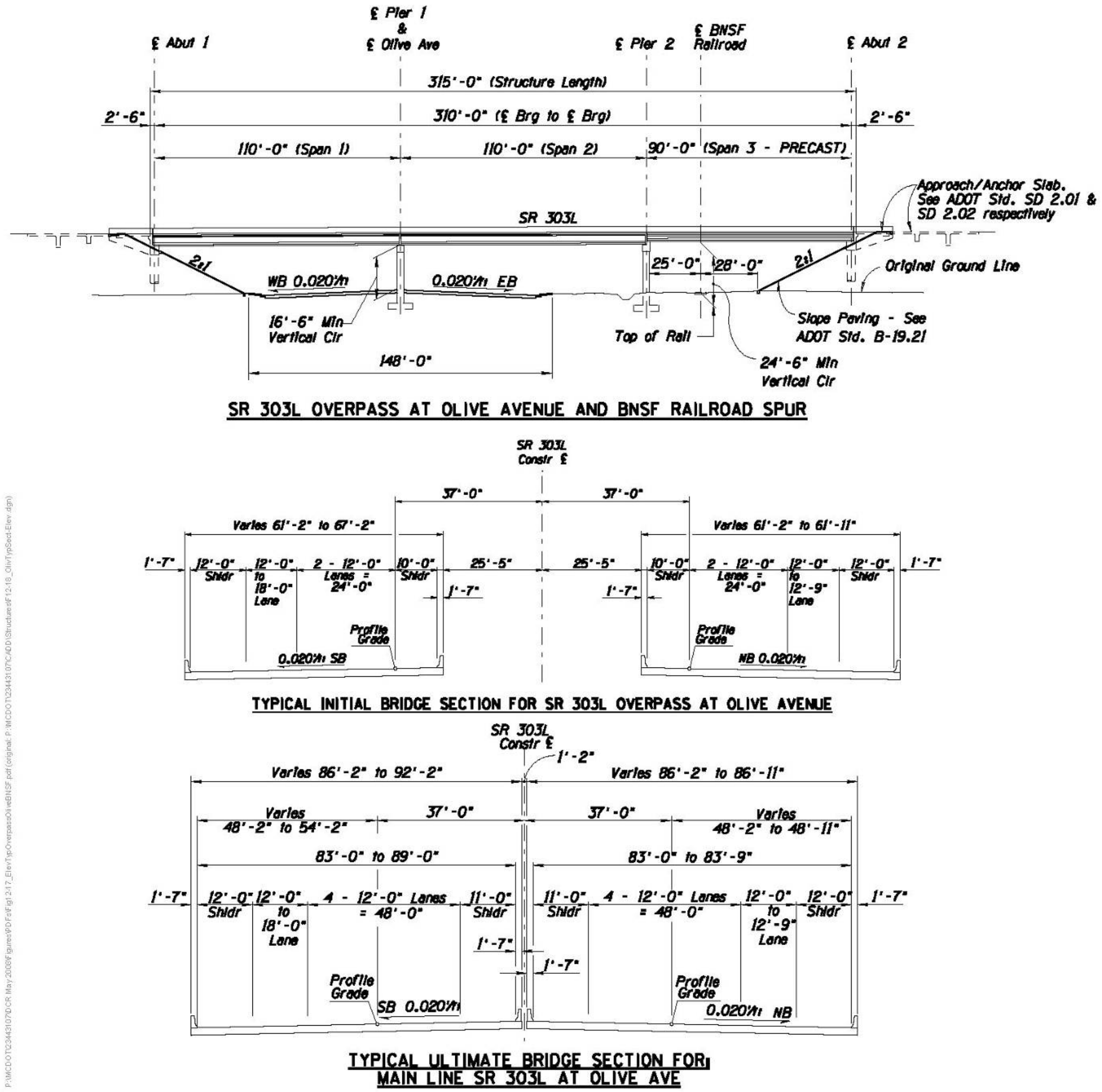

Figure 12-17 Elevation and Typical Section – SR 303L Overpass at Olive Avenue and BNSF Railroad Spur

Northern Parkway System Interchange

The recommended interchange at SR 303L is illustrated in Figure 12-18.

This interchange consists of constructing SR 303L and frontage roads at the lowest level in the interchange (Ground Level). The directional ramps WN, NE and WS will be constructed one level higher (Level 1), and Ramp SE will be at the highest level (Level 2).

The common type of superstructure for the curved flyover Ramps SE and WS is a multi-span cast-in-place post-tensioned concrete box girder. The curved geometry and longer spans lead to choosing the cast-in-place option over the precast option. At this particular location, the system interchange may be built after SR 303L is constructed and opened to traffic. If that is the chosen sequence of construction, precast structures may be considered. If cast in place structures are used, the ramp profiles will need to accommodate the 16 feet of vertical clearance required with falsework.

The ramps are shown as single lanes with a width of 31 feet 2 inches and 42-inch Type "F" traffic barrier (see Figure 12-10 presented earlier). The traffic volumes on Northern Parkway may be higher than shown in this report so ADOT will make provisions for two-lane ramps (see Section 12.11). In addition, the interchange concept now includes E-W frontage roads connecting the N-S frontage roads to Sarival Avenue. This addition will raise the grade of SR 303 and thus increase the length of the ramps and add structures on SR 303 and on ramp WN, and NE. Consideration should be given to two-lane ramps based on recent traffic forecasts.

A summary of the structures involved in this Northern Parkway system interchange is provided in Table 12-5.

Table 12-5 Northern Parkway/SR 303L

Structure Location	Ramp/ Undercrossing	General Profile	Number of Spans	Width (feet)	Length (feet)
Ramp WS	Ramp	Level 1	10	31.17	1,675
Ramp NE	Ramp	Level 1	1	31.17	75
Ramp SE	Ramp	Level 2	11	31.17	2,120
Ramp WN	Ramp	Level 1	1	31.17	95

US 60 (Grand Avenue) System Interchange

This system interchange will have three levels and is shown in Figure 12-19. The lowest level will be depressed roadways for the on- and off-ramps for SR 303L and for US 60. The left turn ramps will intersect at a signalized intersection underneath a bridge for US 60. The BNSF railroad and US 60 will remain at ground level. A new bridge for the SR 303L northbound traffic will be constructed at the same level as the existing Patriots Bridge.

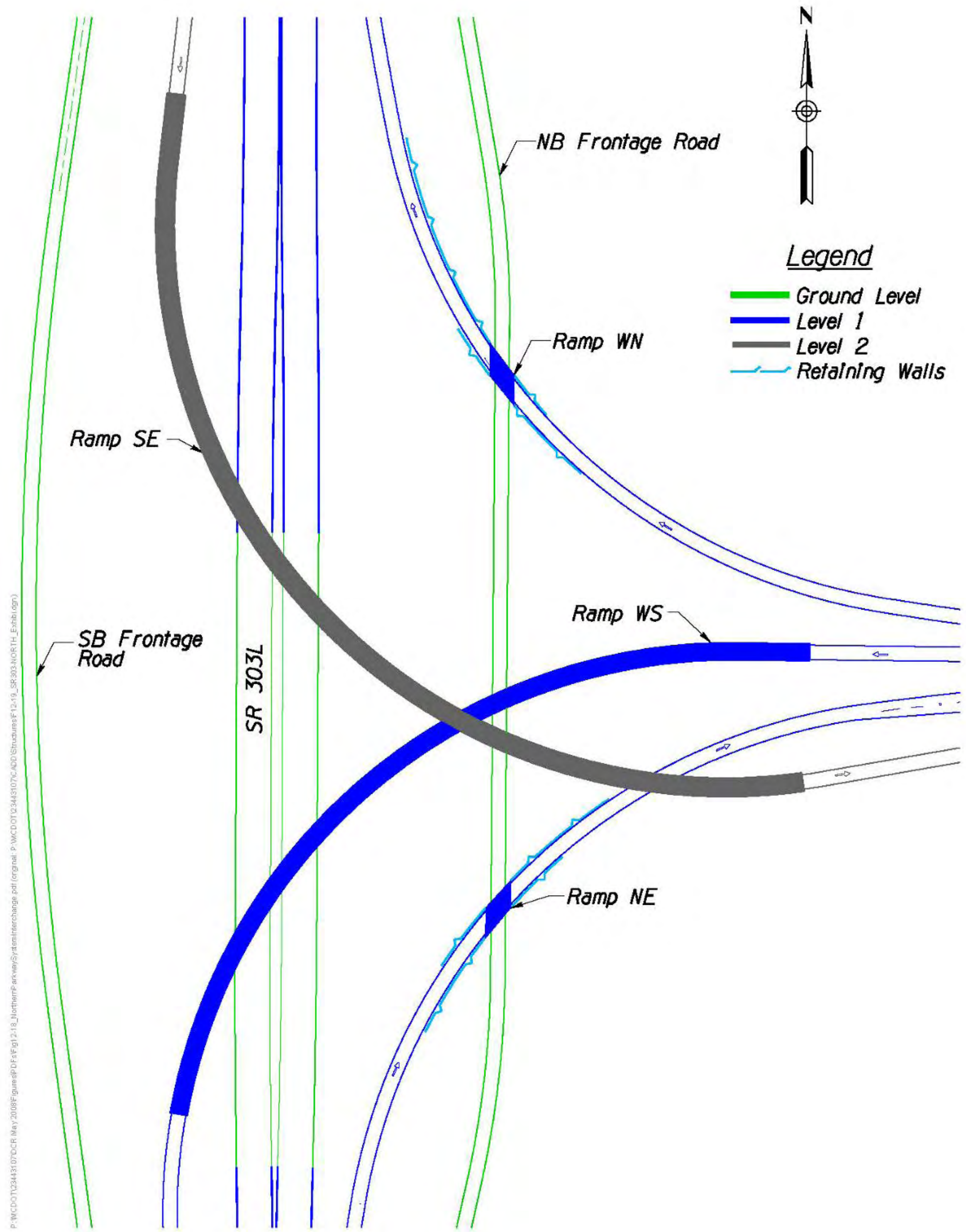

Figure 12-18 Northern Parkway/SR 303L System Interchange

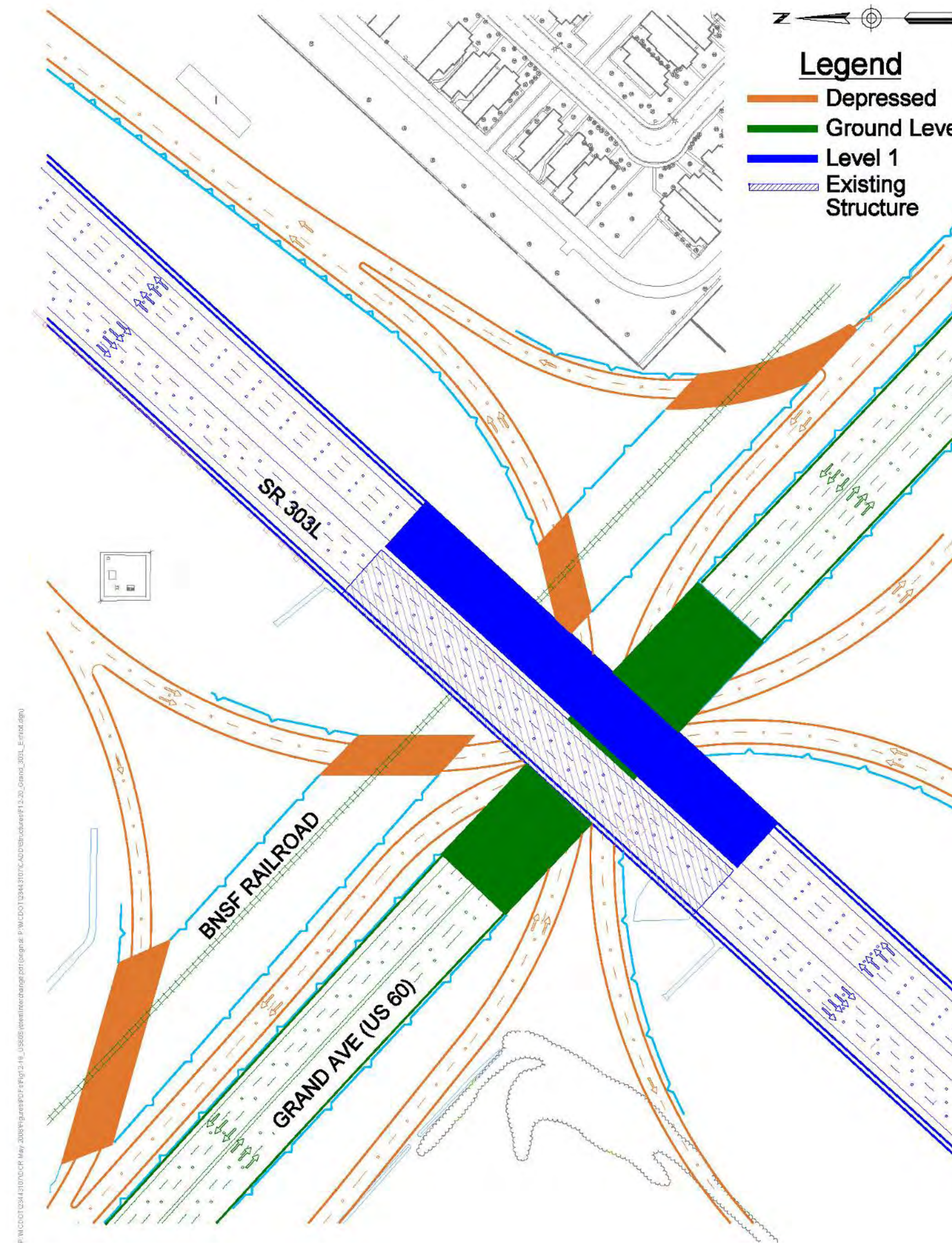

Figure 12-19 US 60/SR 303L Interchange

On- and off-ramps will be depressed under the railroad and US 60. This configuration creates complex structures for the ramps to pass under the railroad and for US 60 to bridge over the intersection of the depressed ramps. Ramps SW and WN will each have a single lane of traffic; Ramps SE and EN will each have two-lanes of traffic. These four skewed structures will need to be built while the railroad is on a shoo-fly alignment to the north. Limiting the time of construction, maintenance, and clearances are key to gaining BNSF cooperation and approval.

The construction sequence will be as follows: (1) After the shoo-fly is in place, construct the south limits of the new undercrossing structures. Use of secant piles for the substructure will expedite construction time significantly. (2) Place deck slabs using soffit fill construction. (3) After the concrete has cured, reconstruct the BNSF railroad in its original location. (4) Complete the undercrossing structures by excavating beneath the deck slabs to final grade of the depressed ramps then construct roadway, underpass wall and barriers (see Figure 12-20).

The US 60 structures over the Beardsley Canal and the McMicken Dam outfall will need to be widened or replaced to accommodate ramp tapers and widened Grand Avenue.

The railroad has also anticipated the construction of two future additional railroad tracks. The estimated length of the undercrossing-structures as shown will accommodate the two future railroad tracks.

US 60 is planned to have three 12-foot lanes of traffic in each direction, a 4-foot median (plus shy distance), and 12-foot right shoulders (see Figure 12-21). The superstructure has been laid out for a 4-span bridge that could be either a cast-in-place post-tensioned concrete box or a precast-prestressed concrete I-girder with a maximum span length of 140-foot.

The US 60 Bridge may be constructed in four phases. In the first phase, half of Grand Avenue (US 60) will be closed in order to construct one-half of a post-tensioned box girder bridge and straddle bent on a soffit fill. With some temporary widening, two lanes of traffic can be maintained on the other half of US 60. In the second phase, traffic will be placed on the new half of bridge and the second half of bridge will be constructed. The third phase will require an approximate 24-hour traffic closure for post-tensioning the straddle bent and the box girder bridge. Last of all, the soffit fill will be excavated out from beneath the bridge. See Figure 12-22.

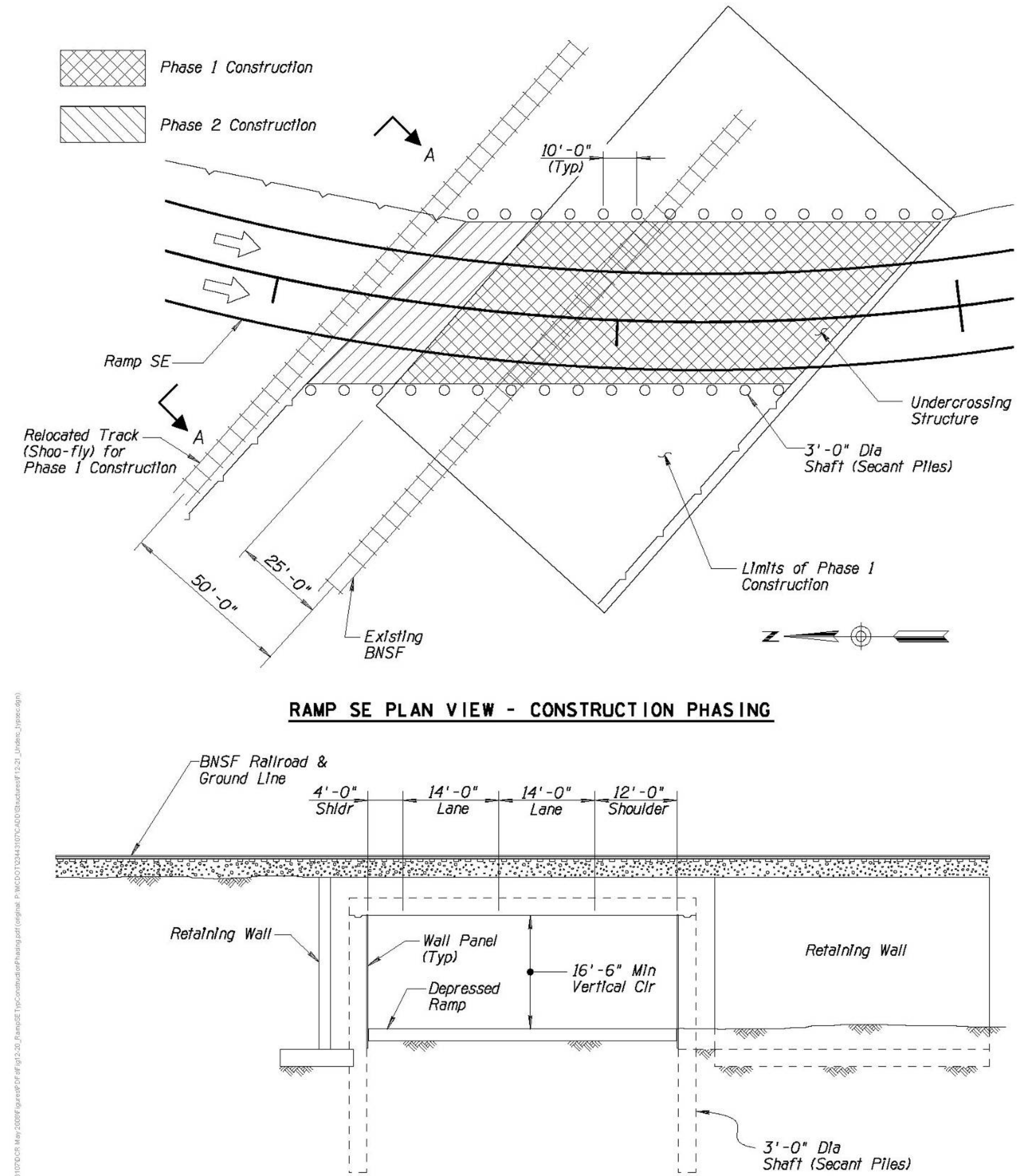

Figure 12-20 Ramp SE – Typical Construction Phasing

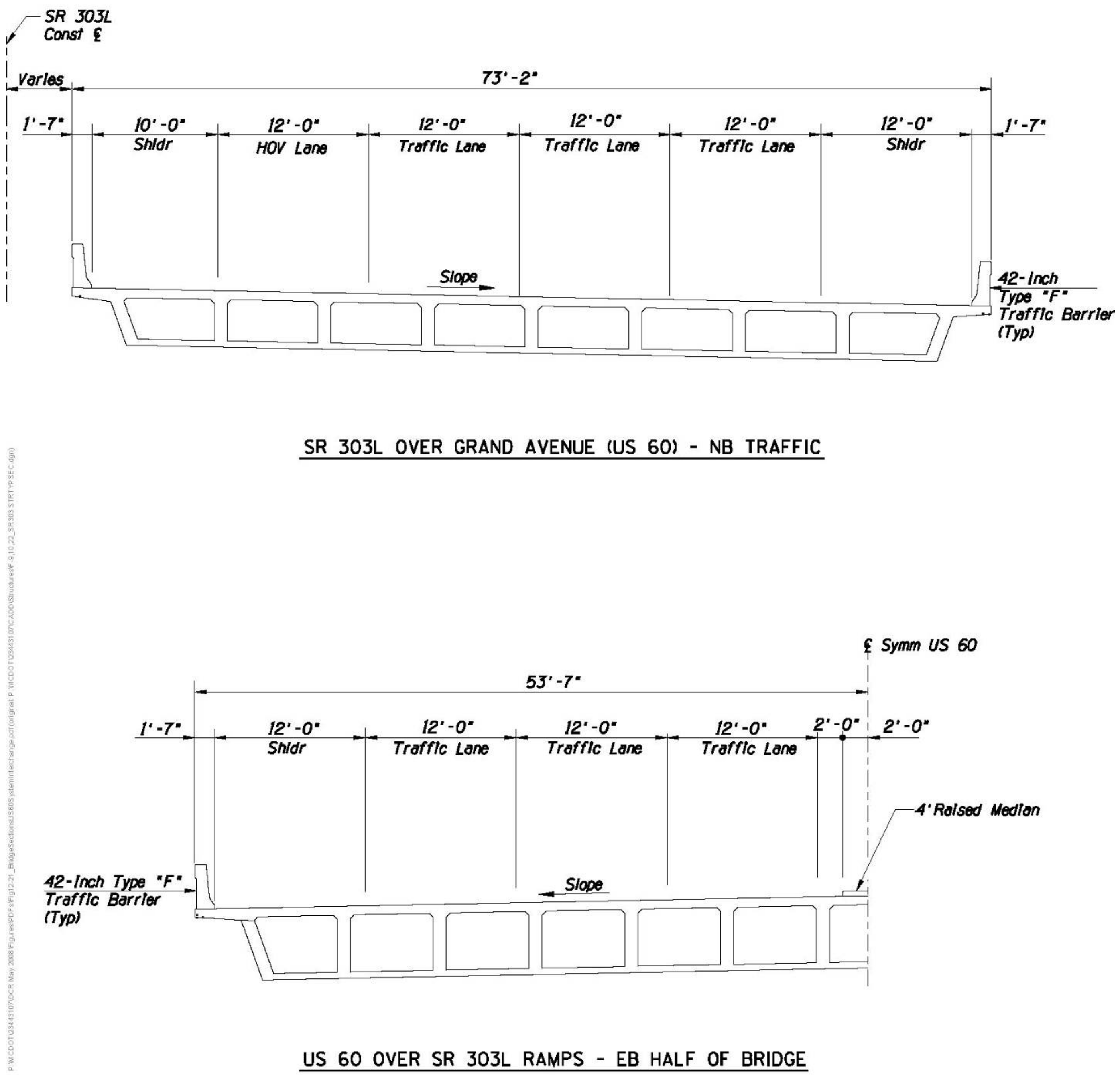

Figure 12-21 Bridge Sections: US 60 and SR 303L at System Interchange

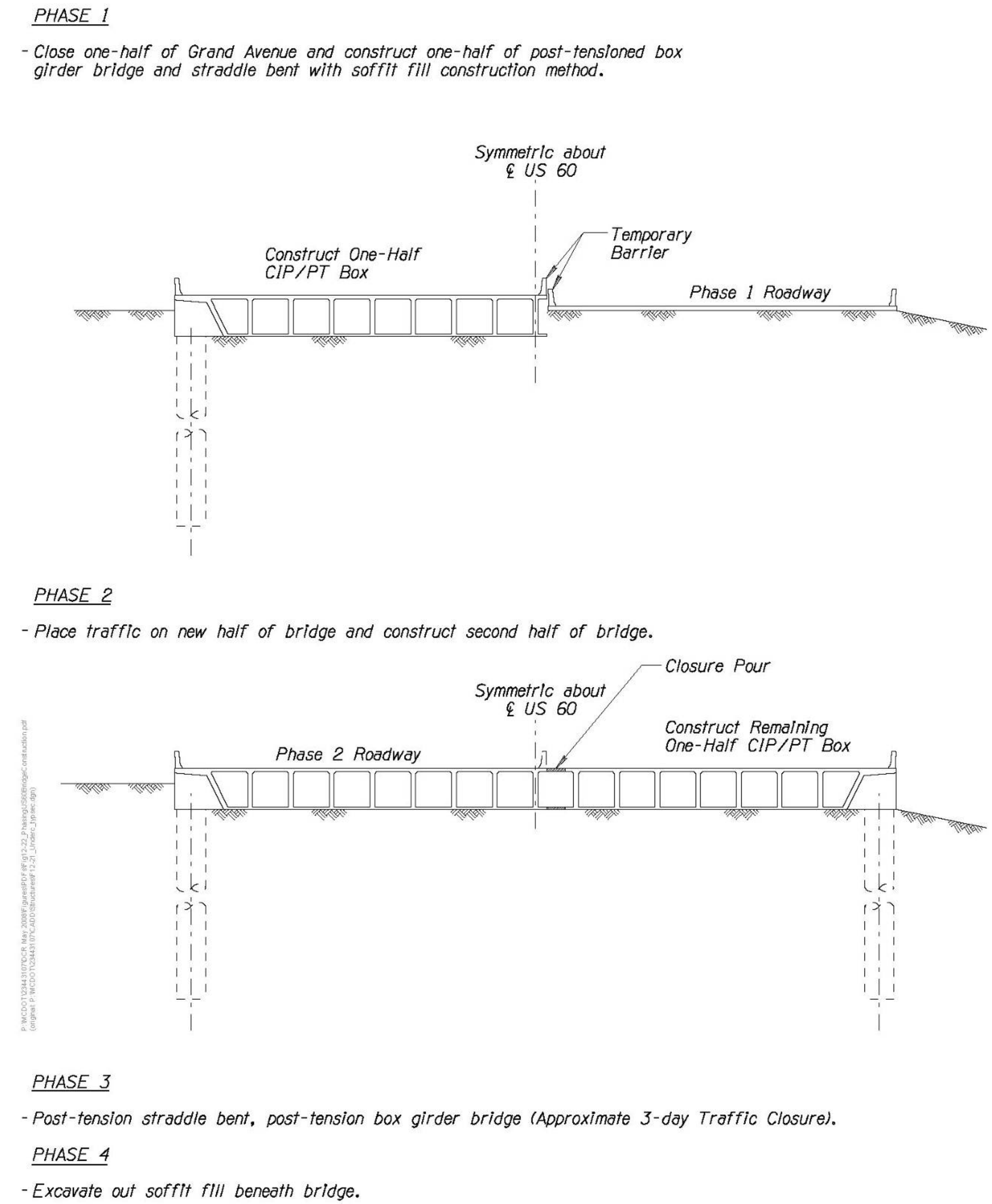

Figure 12-22 Phasing for US 60 Bridge Construction

The US 60 bridge center pier will consist of a straddle bent in order to clear the single point urban intersection (see Figure 12-13 and Figure 12-22). The length of the straddle bent will be approximately 115 feet, supported on drilled shafts. The recommended abutments will consist of stub abutments supported on a single row of drilled shafts or spread footings. These abutments will require long retaining walls at the end of each abutment due to the difference in levels and the tight horizontal geometry of the interchange.

SR 303L is the highest level in this interchange. The southbound structure at this interchange has already been constructed by a previous project with a significant degree of aesthetic treatments. The geometry and architectural treatments of the new bridge (northbound) should be similar to the existing span arrangement in order to blend in with the existing structure.

Similar to the existing bridge, the new northbound structure will consist of four spans. The first, second and fourth spans will be cast-in-place concrete post-tensioned box girders. The third span will consist of a precast-prestressed concrete box girder drop-in-span to eliminate the need for falsework over the railroad. The railroad vertical clearance will be 24 foot-6 inch minimum.

The structure will consist of 4-12-foot lanes and a right 12-foot shoulder and a left 10-foot shoulder. The barriers will be 42-inch Type “F” Traffic Barriers (refer to Figure 12-21).

The existing foundation of the southbound SR 303L bridge is founded on spread footings. Special details for constructing the retaining walls on the first and second pier columns are required in order to miss the imprint of the existing pier spread footing.

A summary of the structures involved in the US 60 interchange is shown on Table 12-6.

Table 12-6 US 60/SR 303L Interchange

Structure Location	Underpass/Overpass/ Undercrossing	General Profile	Number of Spans	Width (feet)	Length (feet)
EB & WB US 60	Underpass*	Ground Level	4	107.17	448
NB SR 303L	Overpass	Level 1	4	73.17	532
WN @ BNSF	Undercrossing	Depressed	1	45	220
EN @ BNSF	Undercrossing	Depressed	1	45	122
SE @ BNSF	Undercrossing	Depressed	1	45	142
SW @ BNSF	Undercrossing	Depressed	1	45	254.5
US 60 over Beardsley Canal	Overpass	Ground Level	1	100.5	50
US 60 over McMicken Dam Outlet Channel	Overpass	Ground Level	1	100.5	116

* Relative to SR 303L; but overpass relative to ramps

Off-Site Drainage Channel Crossing Structures

The proposed drainage channel will begin at Bell Road and extend south to the Gila River. The channel will run adjacent to the west side of the proposed SR 303L Freeway and will provide 100-year flood protection for the roadway.

Channel crossings were generally sized to limit or eliminate backwater/ponding at the inlets. The following three types of crossings will be used along the channel:

1) ADOT Standard Reinforced Box Culverts
    - Used when standard culvert walls do not impede flow.
    - Used when the main arterial is raised above ground level.
2) Single span slab bridge
    - Used when standard culvert walls do impede flow.
    - Used when the main arterial is at ground level.

A summary of the structures selected for the SR 303L channel crossings is displayed in Table 12-7.

Table 12-7 Off-Site Drainage Channel Crossings from Van Buren Street to Bell Road

Structure Location	ADOT Std. RCB/ Bridge	General Profile	Number of Cells	Width (feet)	Length (feet)
Van Buren Street	ADOT Std. RCB	Ground Level	2	24	205
McDowell Road	ADOT Std. RCB	Ground Level	2	24	370
Thomas Road	ADOT Std. RCB	Semi-Elevated	3	30	230
Indian School Road	ADOT Std. RCB	Ground Level	2	24	200
Camelback Road	ADOT Std. RCB	Ground Level	4	48	180
Bethany Home Road	ADOT Std. RCB	Ground Level	4	48	180
Glendale Avenue	ADOT Std. RCB	Ground Level	4	44	175
Northern Avenue	ADOT Std. RCB	Ground Level	4	40	180
Olive Avenue/BNSF Railroad	Bridge*	Ground Level	N/A	235	51
Peoria Avenue	ADOT Std. RCB	Ground Level	4	48	190
Cactus Road	ADOT Std. RCB	Ground Level	4	42	190
Waddell Road	ADOT Std. RCB	Ground Level	4	44	190
Greenway Road	ADOT Std. RCB	Depressed	3	38	170
Bell Road	ADOT Std. RCB	Depressed	2	16	200

* Two bridges; total width = 235 feet (195 feet Olive; 40 feet BNSF)

Bridge Superstructure Type Selection

The following is a discussion of some of the general advantages and disadvantages of cast in place versus precast structures.

The advantages of cast-in-place post-tensioned concrete box girder bridges are:

1. High expertise of local contractors because it is one of the most common structure types in the valley.
2. Where structures can be built on new alignment, the superstructure can be formed on a concrete waste slab supported by existing ground/soffit fill, avoiding the need for falsework.
3. Less superstructure depth than a precast structure, thus minimizing pier height and retaining wall costs.
4. The post-tensioning results in a substantially crack-free concrete section that is very durable and requires minimal maintenance.
5. Generally better aesthetics than the precast concrete alternative.

Possible disadvantages would be longer construction time and greater traffic restrictions if falsework is required.

12.10.2 Bridge Foundation

Foundation Type

Foundation systems that are typically considered for bridges include deep foundations such as drilled shaft foundations or concrete-filled steel pipe piles, and shallow spread footings. In current practice in Arizona, pile foundations are no longer in common use due to the development of high-torque auger drilling equipment that is used to rapidly construct cost-effective drilled shaft foundations.

Drilled shaft foundations can be constructed with minimal disturbance to existing developed areas, and are suitable for construction through newly placed embankment fill or from existing grade, and are the recommended foundation type for supporting bridge abutments at the service interchanges along the SR 303L alignment. More specifically, drilled shaft foundations shall always be used for stub abutments whether the abutment is built on embankment fill or existing grade; conversely, spread footings may be considered for tall abutments built on existing grade. Drilled shaft foundations and shallow spread footing foundations may be considered to support bridge piers at the service interchanges. Shallow spread footings are typically considered to be more cost effective than drilled shafts, especially in depressed roadway segments and where near surface medium dense to dense soil is present, which allows for relatively shallow excavation depths. However, depressed roadway sections are also susceptible to flooding in the event of power loss at a pump station, and the foundation soils may become waterlogged for an extended period of time. Accordingly, use of spread footings in depressed roadway sections will require careful evaluation of foundation soils to determine if they are sensitive to moisture induced settlement or volume change.

In locations with high embankment fills, and where relatively high service loads are expected at ramp structures (e.g., the major five level stack system interchange planned at I-10, and at the North Parkway and US 60 Traffic Interchanges), drilled shaft foundations will probably be more cost effective than large spread footing foundations.

Preliminary Recommendations for Drilled Shaft Foundations

Recommended design procedures and other preliminary considerations related to the design and construction of drilled shaft foundations are presented in this section. Final design parameters should be developed after completion of a detailed geotechnical field investigation throughout the corridor.

The axial capacity of drilled shaft foundations should be evaluated for this project using the β- and α-procedures as presented in AASHTO Section 4.6.5.1 (1996). A minimum factor of safety equal to 2.5 is recommended to obtain service (design or allowable) loads from ultimate axial capacity as per AASHTO Section 4.6.5.4. An appropriate Group Reduction Factor (GRF) should also be applied to the structure service loads where drilled shaft center-to-center spacing is less than 8 shaft diameters.

Once a shaft is sized based on axial capacity considerations, a lateral load analysis should be performed. Use of the LPILEPLUS program (Reese and Wang, 1997) or a similar program is recommended for this purpose. For a group of shafts, an appropriate GRF should be applied prior to the analysis. Alternatively, the GROUP program (Reese and Wang, 1996) can be used for lateral load analysis of shafts in a group. Note that the final length for a given shaft will be the larger of the lengths required from axial and lateral load analyses. The following parameters may be used for preliminary lateral load analysis:

Parameter	Preliminary Value
Soil Unit Weight	110 pcf
Soil Friction Angle	32 degrees
Soil Cohesion	0 psf
Lateral Modulus	100 pci

Additional preliminary recommendations for design and construction of drilled shaft foundations are provided below:

1. The structural engineer may make a preliminary estimate of the drilled shaft foundation configurations using the allowable axial capacity design charts provided in the Geotechnical and Pavement Technical Report.
2. Drilled shaft diameter should be a minimum of 3 feet, and minimum drilled shaft embedment should be 25 feet below lowest adjacent finished grade.
3. Anticipated settlement of drilled shaft foundations should be evaluated during the design phase of each bridge structure after completion of a thorough subsurface investigation. Based on the preliminary borings performed for this study, it is estimated that drilled shaft foundations should settlement by no more than ¼ inches under working loads, and that most of the settlement would be completed during construction as service loads are initially applied.
4. It is anticipated that drilling of the shafts to design depths can be accomplished with conventional, single-flight power augers. Some sloughing of the granular soils should be expected. Therefore, temporary casing may be required on site, and field concrete quantities may exceed the calculated geometric volumes. Shaft concrete should be placed immediately after drilling and cleaning of the excavation.

Preliminary Recommendations for Spread Footing Foundations

The soil encountered during the preliminary geotechnical investigation along the SR 303L alignment, and at the proposed traffic interchanges at I-10 and US 60 are generally medium dense to very dense, and firm to hard, and are suitable for supporting spread footing foundations at bridge structures. Preliminary dimensions of spread footing foundations may be obtained using the maximum allowable bearing pressures shown in Table 12-8. The bearing pressures presented in Table 12-8 should be based on the equivalent uniform bearing pressure distribution per Section 4.4.7.1.1.1 of AASHTO Standard Specifications for Highway Bridges.

Table 12-8 Maximum Allowable Bearing Pressure for Spread Footings at Bridge Structures

Spread Footing Depth Below Existing Grade (ft)	Maximum Allowable Uniform Bearing Pressure (psf)
0 to 10	4,000
> 10	6,500

Spread footings designed based on the allowable bearing pressures presented in Table 12-8 are anticipated to experience total settlement of less than one inch. This settlement is expected to occur rapidly during application of construction loads. Differential settlement of spread footings is expected to be less than ¾-inches.

Abutment and Retaining Walls

For preliminary abutment and retaining wall evaluation, lateral soil pressure should be estimated according to the expected degree of wall restraint, as follows:

- Unrestrained, drained walls that are free to displace a distance of at least 0.1 percent of the wall height should be designed for the active lateral earth pressure condition, represented by an equivalent fluid pressure ($\gamma\ \chi\ K_A$) of 34 pounds per square foot (psf) per foot of soil depth. For sloping backfill, the equivalent fluid pressure should be increased to 42 psf per foot for a backfill slope of 3H:1V, and should be increased to 50 psf per foot for a backfill slope of 2H:1V.
- Relatively rigid or braced walls, for which the deflection required to develop active earth pressures is not expected, should be designed for an "at-rest" earth pressure conditions, represented by an equivalent fluid pressure ($\gamma\ \chi\ K_O$) of 53 psf per foot of soil depth.

The lateral soil pressures given do not include hydrostatic pressure, and retaining walls should be constructed with drainage system and weep holes to prevent saturation of the wall backfill.

Live load surcharge pressure equivalent to a vertical height of two feet of earth should be applied to walls when traffic can come within a horizontal distance from the top of the wall equal to one-half its height.

Lateral loads will be resisted by friction along the base of spread footing foundations and by passive resistance against buried foundations and foundation walls. In accordance with Section 4.4.1.4 of AASHTO (1996), the passive lateral soil resistance should be neglected within the upper three feet of finished grade because of the likelihood of future disturbance. Below a depth of three feet, wall footings and shear keys may be designed assuming a passive lateral soil resistance represented by an equivalent fluid pressure ($\gamma\ \chi\ K_P$) of 360 psf per foot of depth. This value for the passive resistance assumes that the foundation element is in full contact with properly compacted backfill and that the finished grade extends horizontally beyond the footing or shear key at least two times the depth of embedment in the direction of the potential wall movement. Also note that a footing must translate as much as 0.02 times the embedded depth to develop full passive resistance. Accordingly, a factor of safety should be applied to the passive pressure to limit potential deflections.

Wall footings cast directly on underlying soil may be preliminarily designed using a coefficient of base friction of 0.38. Footings constructed with a foundation key may be designed using a coefficient of base friction of 0.60. These values may be used in conjunction with passive pressure when evaluating lateral load resistance without reduction.

Retaining wall footings should be preliminarily designed for a maximum allowable uniform bearing pressure of 3,000 psf. The bearing pressure imposed by a wall footing should be estimated according to the equivalent uniform bearing pressure distribution per AASHTO 4.4.7.1.1.1. The actual contact pressure distribution (i.e., trapezoidal, corresponding to the maximum toe pressure presented in ADOT Standard Detail B-18.20) should be used for structural design. The allowable bearing pressure may be increased by a maximum of 50 percent for short-term overload stresses (e.g., wind loads) in accordance with Table 3.22.1A of AASHTO (1996).

12.11 DESIGN TRAFFIC DATA

This section documents the design hour traffic volumes, laneage and level of service results for the 2030 Ultimate Design Alternative. SR 303L from Interstate 10 to Grand Avenue (US 60) is proposed to be a 10-lane freeway (four general use lanes and one HOV lane in each direction) with auxiliary lanes between interchange on- and off-ramps. Interchanges are proposed generally at one-mile spacing at the following locations:

- Thomas Road
- Indian School Road
- Camelback Road
- Bethany Home Road
- Glendale Avenue
- Northern Avenue
- Northern Parkway
- Olive Avenue
- Peoria Avenue
- Cactus Road
- Waddell Road
- Greenway Road
- Bell Road
- Grand Avenue (US 60)

The mainline laneage, interchange ramp laneage, and design hour volumes used to analyze the 2030 ultimate freeway is illustrated on Figure 12-23 and Figure 12-24. The following subsections describe the results of the traffic operations analyses for the 2030 ultimate freeway.

2030 Ultimate Freeway Operations Analysis

The mainline freeway analyses, including merge/diverge areas and weaving areas, for the 2030 ultimate freeway were conducted using the lane configuration and design hour volumes depicted on Figure 12-23 and Figure 12-24. The results of the mainline freeway analysis are summarized in Table 12-9 and Table 12-10. The mainline is in general expected to operate at LOS D in the peak direction and LOS C in the off-peak direction. As indicated in Table 12-10, all merge/diverge areas and weaving areas are projected to operate at LOS C or better during both the a.m. and p.m. peak hours with the exception of the northbound off-ramp to Northern Parkway. During the p.m. peak hour this diverge is projected to operate at LOS D. The 2030 ultimate freeway merge/diverge area and weaving area operational analyses details are provided in the Traffic Report.

The concept for the Northern Parkway was evolving concurrently with this SR 303L DCR. The latest concept for the parkway is a controlled access highway from Sarival Avenue to Dysart Road. The traffic forecast prepared for the City of Glendale for the parkway indicates the 2030 daily traffic volumes on the parkway east of Sarival Avenue would be 87,000 per day compared to 56,000 per day as included in this report. The volume on the ramps connecting SR 303 and the parkway are also higher in the Northern Parkway report. The volumes on SR 303L are very similar in both reports. Based on the potential for higher ramp volumes and experience elsewhere with system interchanges, ADOT is now strongly considering making provisions for two-lane ramps in the SR 303/Northern Parkway System TI.

2030 Signalized Intersection Operations Analysis

The results of the signalized intersection analyses are summarized in Table 12-11. As indicated in the table, all of the signalized intersections are projected to operate at level of service C or better during both the a.m. and p.m. peak hours with the exception of the US 60/SR 303L interchange. The US 60/SR 303L interchange will have a LOS of D during the p.m. peak. The analysis output sheets for the signalized intersections are included in Traffic Report.

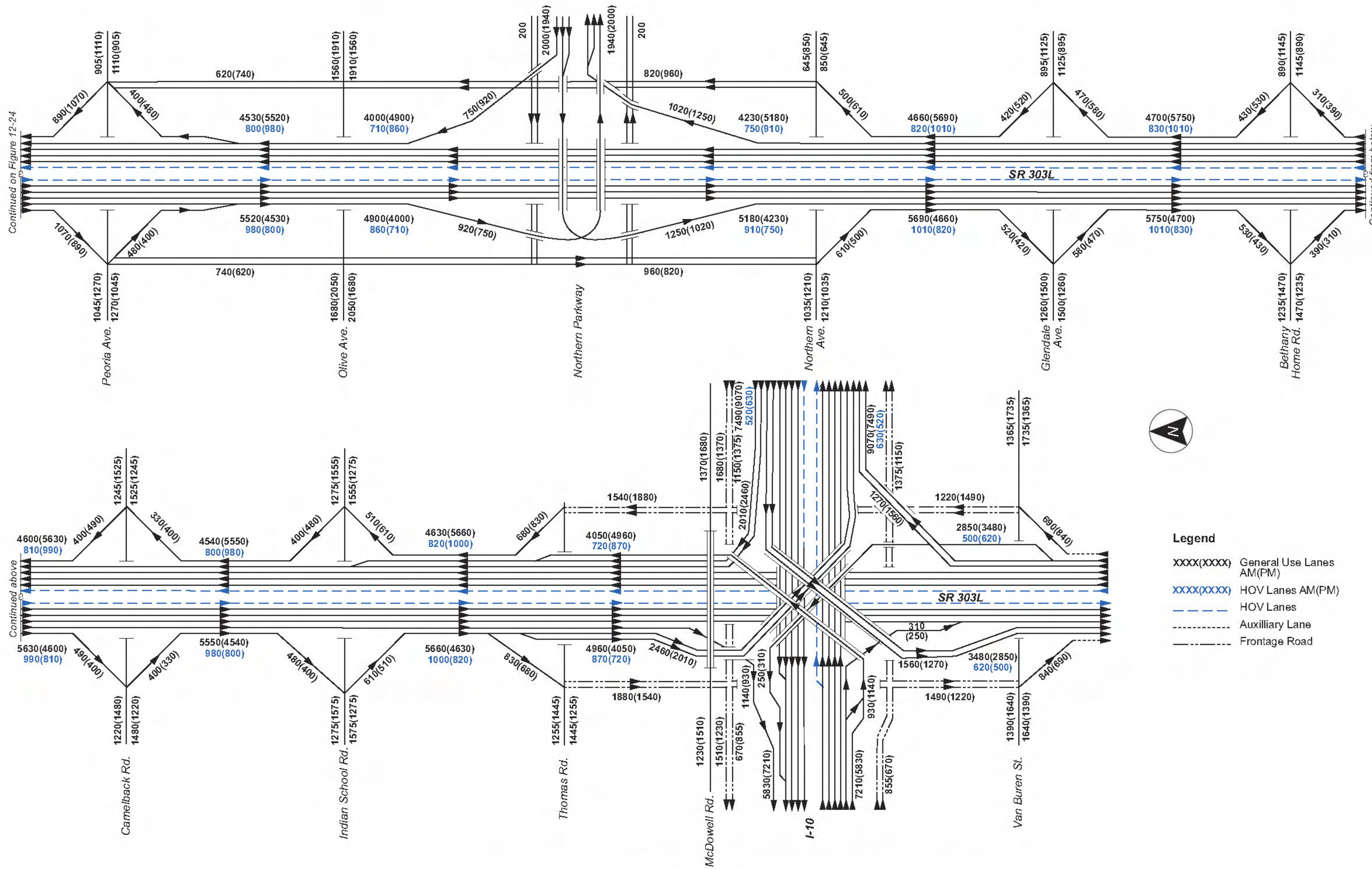

Figure 12-23 2030 Design Hour Traffic Volumes and Lane Line Diagram

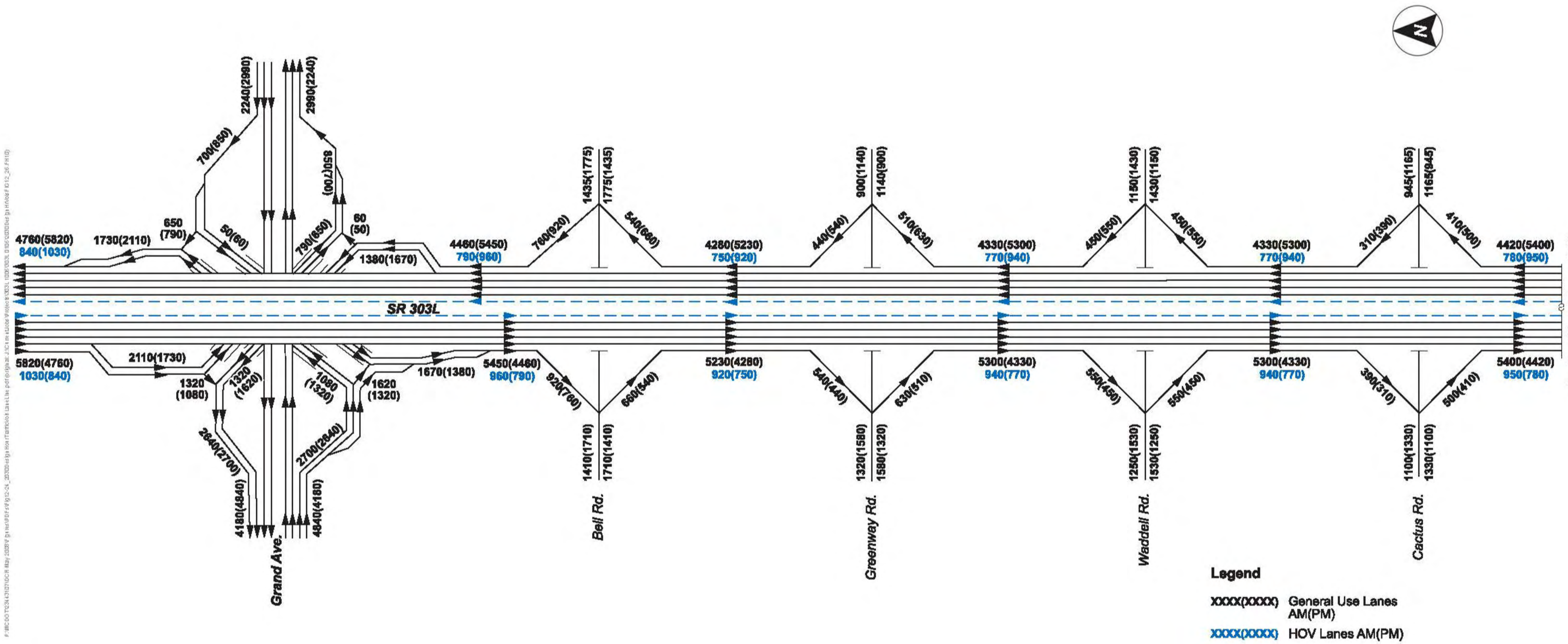

Figure 12-24 2030 Design Hour Traffic Volumes and Lane Line Diagram

Table 12-9 SR 303L Mainline – 2030 Ultimate Freeway Operations Summary

SR 303L Segment	ADT Per Direction	DDHV Per Direction* AM (PM)		LOS Per Direction* AM (PM)	
		NB	SB	NB	SB
At Thomas Road	132,600	4,050 (4,960)	4,960 (4,050)	B (C)	C (B)
At Indian School Road	151,400	4,120 (5,050)	5,050 (4,120))	C (D)	D (C)
At Camelback Road	148,400	4,210 (5,150)	5,150 (4,210)	C (D)	D (C)
At Bethany Home Road	150,400	4,290 (5,240)	5,240 (4,290)	C (D)	D (C)
At Glendale Avenue	153,600	4,230 (5,170)	5,170 (4,230)	C (D)	D (C)
At Northern Avenue	152,200	4,230 (5,180)	5,180 (4,230)	C (D)	D (C)
At Northern Parkway	138,400	3,210 (3,930)	3,930 (3,210)	D (D)	D (D)
At Olive Avenue	130,800	4,000 (4,900)	4,900 (4,000)	C (D)	D (C)
At Peoria Avenue	147,800	4,130 (5,040)	5,040 (4,130)	C (D)	D (C)
At Cactus Road	144,400	4,010 (4,900)	4,900 (4,010)	C (D)	D (C)
At Waddell Road	141,800	3,880 (4,750)	4,750 (3,880)	C (D)	D (C)
At Greenway Road	141,800	3,820 (4,670)	4,670 (3,820)	C (D)	D (C)
At Bell Road	139,800	3,740 (4,570)	4,570 (3,740)	C (D)	D (C)
At US 60 (Grand Avenue)	145,800	3,080 (3,780)	3,780 (3,080)	B (C)	C (B)

* DDHV's and LOS do not include HOV lane.

Table 12-10 2030 Ultimate Freeway Design Hour Operations Analysis Summary

Location	Merge/Diverge LOS		Weaving Area LOS	
	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak
Northbound SR 303L				
Off-Ramp to Eastbound I-10	B	B		
Off-Ramp to Westbound I-10	A	B		
On-Ramp from Westbound I-10	B	B		
On-Ramp from Eastbound I-10	B	B		
Between Thomas Rd. and Indian School Rd.			B	C
Between Indian School Rd. and Camelback Rd.			B	C
Between Camelback Rd. and Bethany Home Rd.			B	C
Between Bethany Home Rd. and Glendale Ave.			B	C
Between Glendale Ave. and Northern Ave.			B	C
Off-Ramp to Northern Parkway	C	D		
On-Ramp from Northern Parkway	B	B		
Between Olive Ave. and Peoria Ave.			B	C
Between Peoria Ave. and Cactus Rd.			B	C
Between Cactus Rd. and Waddell Rd.			B	C
Between Waddell Rd. and Greenway Rd.			B	C
Between Greenway Rd. and Bell Rd.			B	C
On-Ramp from Bell Rd.	B	C		
Off-Ramp to Grand Ave.	B	B		
On-Ramp from Grand Ave.	B	C		
Southbound SR 303L				
Off-Ramp to Grand Ave.	B	B		
On-Ramp from Grand Ave.	C	B		
Off-Ramp to Bell Rd.	C	B		
Between Bell Rd. and Greenway Rd.			C	B
Between Greenway Rd. and Waddell Rd.			C	B
Between Waddell Rd. and Cactus Rd.			C	B
Between Cactus Rd. and Peoria Ave.			C	B
Between Peoria Ave. and Olive Ave.			C	B
Off-Ramp to Northern Parkway	C	C		
On-Ramp from Northern Parkway	C	B		
Between Northern Ave. and Glendale Ave.			C	B
Between Glendale Ave. and Bethany Home Rd.			C	B
Between Bethany Home Rd. and Camelback Rd.			C	B
Between Camelback Rd. and Indian School Rd.			C	C
Between Indian School Rd. and Thomas Rd.			C	B
Off-Ramp to Eastbound I-10	B	B		
Off-Ramp to Westbound I-10	B	A		
On-Ramp from Eastbound I-10	A	A		
On-Ramp from Westbound I-10	B	B		

Table 12-11 2030 Ultimate Freeway Signalized Intersection Operations Analysis Summary

Intersection	AM Peak Hour			AM Peak Hour		
	V/C[1]	Average Delay[2]	LOS[3]	V/C[1]	Average Delay[2]	LOS[3]
SR 303L Northbound Ramps and Van Buren	0.81	20.8	C	0.93	27.6	C
SR 303L Southbound Ramps and Van Buren	0.81	23.6	C	0.79	21.5	C
SR 303L Northbound Ramps and Thomas	0.44	7.3	A	0.49	6.7	A
SR 303L Southbound Ramps and Thomas	0.74	20.7	C	0.61	15.3	B
SR 303L Northbound Ramps and Indian School	0.58	16.3	B	0.60	18.4	B
SR 303L Southbound Ramps and Indian School	0.56	20.3	C	0.52	15.3	B
SR 303L Northbound Ramps and Camelback	0.61	14.4	B	0.63	15.5	B
SR 303L Southbound Ramps and Camelback	0.66	18.8	B	0.62	15.0	B
SR 303L Northbound Ramps and Bethany Home	0.46	14.2	B	0.57	17.9	B
SR 303L Southbound Ramps and Bethany Home	0.70	19.7	B	0.65	16.2	B
SR 303L Northbound Ramps and Glendale	0.53	17.8	B	0.61	20.8	C
SR 303L Southbound Ramps and Glendale	0.68	20.3	C	0.64	16.1	B
SR 303L Northbound Ramps and Northern Ave.	0.44	14.5	B	0.54	19.1	B
SR 303L Southbound Ramps and Northern Ave.	0.73	23.3	C	0.73	26.3	C
SR 303L Northbound Ramps and Olive	0.75	18.5	B	0.76	21.4	C
SR 303L Southbound Ramps and Olive	0.75	20.0	C	0.72	17.1	B
SR 303L Northbound Ramps and Peoria	0.52	15.0	B	0.62	17.9	B
SR 303L Southbound Ramps and Peoria	0.56	19.8	B	0.49	13.4	B
SR 303L Northbound Ramps and Cactus	0.49	15.6	B	0.60	19.1	B
SR 303L Southbound Ramps and Cactus	0.60	20.1	C	0.52	13.7	B
SR 303L Northbound Ramps and Waddell	0.52	17.2	B	0.55	18.5	B
SR 303L Southbound Ramps and Waddell	0.59	18.1	B	0.55	14.9	B
SR 303L Northbound Ramps and Greenway	0.54	18.2	B	0.64	21.3	C
SR 303L Southbound Ramps and Greenway	0.71	20.8	C	0.67	16.4	B
SR 303L Northbound Ramps and Bell	0.67	17.5	B	0.80	23.3	C
SR 303L Southbound Ramps and Bell	0.74	24.1	C	0.74	18.9	B
I-10 Eastbound Ramps and Citrus	0.67	18.2	B	0.65	15.5	B
I-10 Westbound Ramps and Citrus	0.78	17.8	B	0.78	18.1	B
I-10 Eastbound Ramps and Sarival	0.84	21.7	C	0.73	16.0	B
I-10 Westbound Ramps and Sarival	0.68	27.0	C	0.78	26.5	C
I-10 Eastbound Frontage and SR 303L Southbound Frontage	0.70	11.7	B	0.51	14.5	B
I-10 Eastbound Frontage and SR 303L Northbound Frontage	0.67	13.2	B	0.61	11.2	B
I-10 Westbound Frontage and SR 303L Southbound Frontage	0.78	11.8	B	0.68	12.8	B
I-10 Westbound Frontage and SR 303L Northbound Frontage	0.69	12.0	B	0.88	21.2	C
SR 303L Northbound Frontage and McDowell	0.78	22.7	C	0.77	22.1	C
US 60/SR 303L Stacked SPUI	0.83	19.0	B	0.99	38.1	D
SR 303L Southbound Frontage and McDowell	0.94	31.0	C	0.96	31.5	C

(1) Volume to capacity rate
(2) Delay, in seconds, per vehicle
(3) Level of service as defined by the 2000 *Highway Capacity Manual*

12.12 PAVEMENT DESIGN

The basis for the pavement design and the preliminary recommendations is presented in Chapter 9. In summary, the freeway mainline and ramps are recommended to be PCCP. The recommended depth for the mainline is 14.5 inches of PCCP. The mainline and some higher volume ramp pavement is recommended to be dowelled. The mainline will be overlaid with 1 inch of rubberized asphalt concrete finishing course.

12.13 UTILITIES

As highlighted in Chapter 3, many utilities presently cross the SR 303L corridor with the majority located at the arterial cross streets. The greater part of these utilities will need to be relocated and careful coordination with the utility providers will be required.

As development continues to occur along the SR 303L corridor in the future, new utilities will be needed to service the new developments. In particular, trunk sewers and domestic water mains will be needed at most of the arterial cross streets. Additional underground telephone, gas, and cable facilities will be needed at many of the arterial cross streets as well. Additional overhead or underground electric lines will also be needed.

Some future utilities have already been planned including new water mains proposed by Arizona American Water Company at the north end of the corridor. Also, the City of Surprise and The City of Goodyear have indicated that trunk sewer lines are likely to be provided at each of the arterial street crossings within their respective cities. It should be noted that both the cities are currently updating their water and sewer master plans. Upon completion of this work, additional future water and sewer crossings may be identified.

There is a proposed 30-inch sewer, owned by Litchfield Park Service Company, that will cross SR 303L approximately ¼ mile south of Thomas Road in a 42-inch steel sleeve and then run along the eastern SR 303L right-of-way to McDowell Road. The sewer has ample cover with regard to the SR 303L pavement profile; however, additional protection may be required for the storm drain needed to drain the SR 303L at Thomas Road. Additionally, LPSCO has a sewer treatment facility under construction in the southwest quadrant of McDowell Road and Sarival Avenue. The I-10/SR 303L construction will not directly impact the site; however, it may impact services going to and from the site.

Most of the existing utilities shown in Table 3-1 presented in Chapter 3 will likely be impacted by the SR 303L improvements and relocations can be anticipated. The utilities shown on Table 12-12 are future utilities for which some planning has been done. Design of these utilities should be coordinated with the future SR 303L improvement concepts.

Table 12-12 Future Planned Utilities

Company	Utility	Existing/ Future	Size/Type	Location
Arizona American Water Company	Water	Future Future Future	12" Trans. Main 36" Pipeline 12" Pipeline	¼ mile north of Greenway Road Either Waddell Road or Cactus Road Greenway Road
City of Surprise	Sanitary Sewer	Future		At Bell Road, Greenway Road, Waddell Road and Cactus Road
City of Goodyear	Sanitary Sewer	Future		Cotton Lane, Citrus Road, Sarival Avenue,
Litchfield Park Service Company	Sanitary Sewer Treatment Facility	Under Construction	30" Pipeline	¼ mile south of Thomas Road Southwest quadrant McDowell Road and Sarival Avenue

In addition to the main pipelines highlighted in the above table, Arizona-American Water Company has developed a preliminary "Potable Water Master Plan" for future growth of their distribution system. This plan entails numerous crossings at mile and ½ mile locations to service possible domestic/industrial developments.

APS is proposing a 230kV transmission line, part of which will run parallel to the SR 303L between Bethany Home Road and Olive Avenue. This line is part of APS's West Valley-South Project. The route was recommended by the Arizona Power Plant and Transmission Line Siting Committee, and will likely be approved for construction by the Arizona Corporation Commission. Early discussions have been held between APS and MCDOT to coordinate right-of-way needs to reduce costs to both parties. Furthermore, APS is currently conducting a feasibility study further north to locate similar 230kV facilities. This study is part of a "sister project" called the West Valley-North Project and could have further impact on the SR 303L.

In addition to APS, El Paso Natural Gas Company wishes to acquire a 50- to 100-foot wide strip of right-of-way adjacent to APS from Northern Avenue extending south to Indian School Road for a 36-inch gas line. However, the future of this pipeline could be in doubt because of opposition from West Valley cities and Luke AFB.

12.14 IRRIGATION

Irrigation facilities that are affected by the proposed SR 303L can be grouped into two main groups based on the ownership or user of the facility. These groups are: private irrigation users and irrigation or water districts. Section 3.4 of this report discusses the existing conditions found at the time of this DCR. The irrigation districts impacted by Loop 303L include the MWD, AWC, and RID. Each of the groups has various interests and requirements to be met and maintained during and after the construction of the proposed SR 303L facilities.

The concepts for relocating or rerouting the irrigation facilities along SR 303L are typical based on the location where the facility is encountered. Pipes and ditches that are parallel to the roadway will be moved to the new right-of-way limits and continue the parallel alignment of the irrigation facility where possible. Pipes and ditches that run perpendicular to the roadway and cross the current alignment will be lengthened to have the inlet and outlet located beyond the new proposed right-of-way. In areas where the roadway is depressed, the pipes and ditches crossing the roadway will be designed as inverted siphons or be routed to locations where gravity crossings will operate. Other irrigation facilities impacted by the roadway are the tailwater ditches and tailwater retention basins (sumps). These sumps are used in farm operations to remove ponded irrigation water from the low end of the field. This tailwater, if it were to remain on the field, would drown out and eventually kill the crops. Where the roadway impacts these tailwater facilities, they will have to be replaced or the volume lost would have to be replaced.

Generally, relocation of irrigation facilities owned by MWD and AWC should be done as follows:

- Relocations should be as close as possible to the location of the existing facilities.
- Inverted siphons are not allowed without specific approval from the district where no other alternative will work.
- Flow rates and design requirements of the replacement facilities are provided to the designers and then district engineers check the design and will accept or reject it.
- Structures relocated or improved that currently have a tailwater connection back to delivery laterals must be built to remove this connection.

AWC anticipates continued high demand for irrigation water for many years. Much of the area within the AWC district boundaries is within the flight path of Luke AFB and is not likely to experience residential development in the near future. The larger residential parcels within the district generally want irrigation water. Much of the agricultural land in this area consists of high investment operations (roses, cotton, etc.) and is likely to continue in agricultural use in the future.

Between Northern Avenue and Camelback Road, AWC has a 45-foot wide right-of-way adjacent to the SR 303L existing right-of-way for their distribution pipes. The distribution pipes will have to be relocated to the east side of the future SR 303L right-of-way and replacement right-of-way provided for AWC. In addition, the AWC network has a distribution structure at the southeast corner of Northern Avenue and SR 303L. This structure is the highest point of the AWC network. Water from the Beardsley Canal can enter the AWC network from the west and/or water from AWC wells east of the SR 303L along Northern Avenue can enter the AWC network. This structure and corresponding network will need to remain in service until a replacement structure is completed.

Large irrigation sumps present a problem both to the roadway construction and to the farm operations. New sumps must be built prior to the filling of the existing sumps. Backfilling the existing sumps for roadway construction is critical because many of these sumps have been in a saturated condition for many years and may require over-excavation, backfilling, and compaction prior to construction of bridges or roadway structures. In most cases, the existing sumps will need to be replaced in volume and function. The proposed irrigation relocation plans for the SR 303L DCR have proposed locations for the replacement sumps.

As the design process continues, farmers will need to be contacted with regard to private irrigation facilities and plans made for implementing the new and relocated facilities. Consideration will have to be given to growing season and possible crop damage. This will avoid costly claims of negative impact on the farm operations.

Since the MWD does not have nor do they desire to have inverted siphons, efforts should be made to convey water across the SR 303L alignment at depressed sections without using siphons. Bell Road would require a particularly deep siphon under current design. Preliminary designs show that rerouting the pipeline along the roadway to a shallow location on the profile is not feasible. Consultation with the MWD will need to be done to determine the design parameters.

The RID impact is at the very south end of the project. The RID main canal crosses the south half of the I-10 Loop 303L interchange. The RID requires an open flow box crossing that will not impact flow conditions in the canal. The canal slope is extremely mild through this section and any adverse impact to the hydraulic grade will impact the canal for miles.

Preliminary designs show a 3 barrel 8 feet by 10 feet reinforced concrete box culvert will meet these design criteria. A preliminary design box culvert design conditions are:

- Estimated No. of Barrels 3
- Estimated Barrel Size 10 feet (span) x 8 feet (rise)
- Estimated slope 0.0003 ft/ft
- Estimated Length Right-of-Way to Right-of-Way (1,150 feet)
- O& M Road Turnarounds on each end
- Facility Access Frontage roads or other slow speed road

The invert elevations must match the invert elevations of the existing canal at the tie-in (ROW) locations to prevent backwater effects in the canal.

The canal must remain in service during the construction of the TI. This may require the box to be built early in the schedule and require a shoo-fly or bypass design. The by-pass design for RID would require lining to prevent saturation of adjacent ground and excessive losses to the canal flow. The lining could be shotcrete or a temporary plastic liner. The bypass must convey the same flow rate as the existing canal (approximately 500 cfs). A short dry-up could be arranged with the district to facilitate the bypass cut-over and replace it with standard structural lining for the canal. The contractor could also provide a pump around to accomplish the same thing.

The RID canal relocation will require the installation of two turnout structures on the east side of SR 303L conveying irrigation water to the south. One turnout conveys irrigation water to the south in a 36-inch pipeline and the other delivers irrigation water to the field immediately south of the canal. O&M Roads will also be required to provide access to any facilities cut off by SR 303L.

12.15 WELLS

The proposed SR 303L roadway passes through approximately 12 miles of agricultural land. Maintaining a continuous supply of water to these lands is essential. Chapter 3 contains a description of the existing irrigation and wells systems in the area.

Table 12-13 contains information about the 16 irrigation wells located within the planned project right-of-way. The wells that are affected by the proposed SR 303L are owned or used by a number of entities including (1) private, (2) MWD, (3) AWC, (4) SunCor Development, and (5) RID. Each of the entities have various interests and requirements to be met and maintained during and after the construction of the proposed SR 303L facility.

Table 12-13 Wells Located Within Existing Right-of-Way

Town-ship	Range	Section	Coordinates	Registration # (55-)	Station (+/-)	Depth (ft)	Diameter (in.)	Cross Street	Owner	Remarks
T1N	R2W	1	CCC	607101	280+00	1902	18	Van Buren Street	RID	Irrigation
T2N	R2W	36	BCA	Unknown	385+00	Unknown	Unknown	McDowell	SunCor	Irrigation
T2N	R2W	36						Cotton Lane North of McDowell	SunCor	Irrigation
T2N	R2W	24	BBB	611694	492+00	998	16	Camelback	SunCor	Irrigation
T2N	R2W	13	ABB	501837	545+00	Unknown	Unknown	Bethany Home	AWC	Irrigation
T2N	R2W	12	ACC	501836	572+00	1,400	18	Between Bethany Home and Glendale	AWC	Irrigation
T2N	R2W	12	ABB	502487	592+00	1,105	16	Glendale	AWC	Irrigation
T2N	R2W	12		Unknown	650+00	Unknown	Unknown	Northern	AWC	Irrigation
T3N	R2W	36	ABB	613004	703+00	1,000	16	Olive	Maricopa	Irrigation
T3N	R2W	25	DBB	606608	730+00	1,200	20	Between Olive and Peoria	Property Reserve Arizona	Irrigation
T3N	R2W	25	BAA	612998	756+00	1,000	16	Peoria	Maricopa	Irrigation
T3N	R2W	24	ABB	500768	808+00	1,050	16	Cactus	Robert Moore	Irrigation
T3N	R2W	24	ABB	617465	808+00	1,050	16	Cactus	Robert Moore	Irrigation
T3N	R2W	13	BAA	612990	861+00	930	16	Waddell	Maricopa	Irrigation
T3N	R2W	12	BAA	612986	915+00	1,000	16	Greenway	Maricopa	Irrigation
T4N	R2W	36	BDA	575578	1020+00	Unknown	Unknown	South of Clearview	Maricopa	Irrigation
T4N	R1W	19	BAA	612960	1137+00	1,080	16	North of US 60	Recreation Centers of Sun City West	Irrigation

Note: Coordinates refer to the 1/64 section location of the wells.

Replacement of Existing Wells

All 15 irrigation wells within the SR 303L right-of-way will need to be relocated prior to construction of the freeway. It is also recommended that sites for the relocated wells be identified and acquired before much development occurs along the corridor that would make finding suitable sites more difficult.

Meetings were held with representatives of the MWD and AWC to review their operations and to identify key issues related to the relocation of their facilities. Following are some of the key points from these meetings:

- Besides owning groundwater wells, the MWD also has rights to an allotment of Central Arizona Project surface water. The majority of surface water is utilized during the fall and winter seasons, and the groundwater wells operate during the spring and summer.
- AWC's wells operate all year long. AWC supplies approximately 8,000 acre-feet of irrigation water each year. Approximately 80% of this is well water.
- The majority of the wells within the SR 303L right-of-way provide gravity irrigation for agricultural lands along the east side of the SR 303L corridor. Replacement wells must be located near the existing wells or relocated west of the SR 303L corridor.
- New well sites will need to be approximately 75 feet square in size to accommodate equipment and vehicles. Access will need to be provided from the local street system.
- All the districts desire to have equivalent operating replacement wells provided to them rather than compensation for the value of the existing wells.

Conceptual design drawings for the ultimate freeway improvements are provided in Chapter 15. These drawings show preliminary proposed sites for 15 of the 16 irrigation wells that will need to be relocated as well as relocated irrigation ditches, canals, and pipes. Potential access to the proposed well sites is also shown on the drawings. A nearby site is not available for the MWD well located near Clearview Boulevard. The future site of this well is unknown and is not shown on the drawings. It should be noted that this well would be considered a new well, and the existing MWD Well No. 3-36 would be abandoned. The new well would be located somewhere upstream of the present location to allow for the same quantity of water to be conveyed in MWD Lateral 3. The MWD owns property in various locations in the district where the new well could be located.

In addition, a new location has not been determined for the Recreation Centers of Sun City West well located north of US 60. It will also be considered a new well and the existing well would be abandoned.

Contact with Recreation Centers of Sun City West did not establish the location of the well's pipe distribution network. The well is used to water the golf courses in Sun City West and it is anticipated the pipe network extends under the current SR 303L.

Equivalent replacement wells may be provided by the transportation agency (MCDOT or ADOT) or the well owners may be compensated for the value of the existing wells. Either way, several important issues pertaining to the permitting and location of replacement wells need to be understood. The following paragraphs provide an explanation of the issues and approximate costs.

Abandonment of Existing Wells

Abandonment of existing wells will require permitting, removal of pumping equipment, video survey, and bailing of sediments to original total depth. If oil is present on the water surface from pump lubrication, it will require bailing, profiling, and disposal. Because the wells penetrate multiple aquifer systems and have the potential to communicate flow between intervals of poor quality water to deeper intervals, abandonment will likely require ripping of the well casing with a downhole casing knife and backfill with cement slurry. Demolition of the well site and removal of electrical equipment, fencing, concrete pads, and conveyance structures may also be required. Well sites may have soil contamination from engine and pump lubricants and the use of solvents for equipment maintenance. Costs for well abandonment are estimated to be approximately $52,000 per well (Table 12-8).

Permitting of Replacement Wells

A drawdown impact analysis for neighboring wells is not required for replacement wells that meet the following conditions for location and pumpage. A new well can be permitted as a replacement well if it is drilled within 660 feet of the existing well it is replacing and the proposed annual pumpage is reasonably similar to historical use. If pumpage records are available for the existing well, the new well can be permitted for a similar annual volume of pumpage. If pumpage records are unavailable, the annual volume equivalent to pumping at the reported pumping rate for 50% of the year will be permitted. It is anticipated that 13 wells can be relocated within 660 feet of the original location and, therefore, should receive automatic permit approval for similar pumping volumes.

If a replacement well is drilled beyond 660 feet from the original well or requires pumpage larger than historical use, it is treated as a new well. A groundwater right is required and could be transferred from the existing well being replaced. A drawdown impact analysis is required to demonstrate impact on nearest wells from the proposed pumpage at the new well. If drawdown is 10 feet or less for a five-year period, the well and pumpage are automatically accepted. If drawdown is 25 feet or more in a five-year period, the well and pumpage will be rejected. If projected drawdown is between 10 and 25 feet, the permit is subject to further review and additional data and studies may be required. In addition, permit applications for wells in areas of known land subsidence or poor groundwater quality may require supplemental information and studies. It is anticipated that two wells, located at Station 1020+00 north of Bell Road, and Station 1137+00 north of US 60, will be relocated beyond the 660-foot limit and will require permitting as a new well including analysis of drawdown impact on the nearest neighboring wells. It is possible that drawdown constraints on nearby wells may result in a reduction in the permitted pumpage for the new well location. Costs for preparing a drawdown impact analysis and permit application for one new well location is estimated to be approximately $3,100 (Table 12-14).

Table 12-14 Cost Estimate for the Replacement of Irrigation Wells

Scope of Work	Cost Estimate
Well Abandonment Costs per Well	$52,000
Well Construction Permit Application Costs per Well	
Without Drawdown Impact Analysis	$1,000
With Drawdown Impact Analysis	$3,100
Well Construction Costs per Well	
Installation of Replacement Well	$570,000
Well Site Construction, Pump Installation, and Electrical Services	$78,000
Construction Modifications to Improve Water Quality, Zonal Sampling During Well Construction, 4 Zones per Well, Install Well Seal	$62,000
Well Yield Investigations	
Well Location Study for Well Yield	$26,000
Exploration Drilling, Testing and Sampling (per Test Well)	$130,000
Water Quality Investigations	
Well Location Study for Water Quality, Sample 6 Existing Wells	$26,000
Logging and Testing of Existing Wells (per Well)	$36,000
Exploration Drilling, Testing and Sampling (per Test Well)	$130,000

Locating and Design of Replacement Wells Based on Well Yield

If compensation to the well owners is not provided and the transportation agency is responsible for construction of replacement wells with similar yield and specific capacity, a preliminary well location study should be conducted for the project area. The cost for a well location study based on well yield is estimated to be approximately $26,000 (Table 12-14). Specific capacity is the ratio of pumping rate divided by the amount of drawdown in units of gallons per minute per foot of drawdown and is useful for comparing pumping lift costs. To evaluate potential yield and specific capacity of replacement wells, the following information should be prepared and analyzed:

- Map – Contour Map of Groundwater Level Altitude
- Map – Contour Map of the Base of Upper Alluvial Unit
- Map – Contour Map of Upper Alluvial Unit Saturated Thickness
- Map – Well Locations with Screened Interval and Specific Capacity
- Graphs – Water Level Hydrographs of Nearby Wells to Evaluate Long-term Trends and Seasonal Variations
- Table – Well Inventory with Construction Details, Pumping Rate, and Specific Capacity

If review of the data indicates that specific capacity does not vary widely for nearby wells of similar construction and saturated thickness of the upper alluvium unit is similar for the replacement well site compared to the original well site, chances for drilling a replacement well that will have similar yield and specific capacity are good. If large variations in specific capacity or saturated thickness of the upper alluvium occur in the project area, additional investigations may be warranted to evaluate potential well sites. Additional investigations may include exploratory drilling and geophysical logging to evaluate aquifer lithologic properties, and construction of smaller diameter, temporary wells to estimate potential yield, specific capacity, and aquifer hydraulic parameters. Costs for exploratory drilling and testing of one temporary test well are estimated to be approximately $136,000 (Table 12-14). The number of test wells that might be required would depend on data gaps identified in the available data.

Locating and Design of Replacement Wells Based on Water Quality

Historical agricultural use in the project area has resulted in poor groundwater quality in the upper alluvial unit resulting from infiltration of irrigation water potentially containing elevated concentrations of total dissolved solids, nitrates from fertilizers, and trace amounts of pesticides and herbicides. Nitrate concentrations may exceed drinking water standards. The underlying middle alluvial unit is predominantly sandy silt and clay and has better quality water but produces less water than the upper alluvial unit which is predominantly silty sand and gravel.

Agricultural wells where drinking water requirements are not a concern are typically screened across both units for maximum yield. Municipal wells are typically constructed to limit the amount of poor quality water yielded from the upper unit. Replacement wells drilled with screened interval similar to the original well in close proximity where the saturated thickness of the upper alluvium unit is comparable should produce similar yield and specific capacity. Modifications to well design to produce drinking water quality water will require additional costs for zonal sampling and well seals; additional costs are estimated to be approximately $52,000 per well (Table 12-14).

However, any reduction in the upper alluvium unit saturated screened interval will likely result in reduced well yield, reduced specific capacity, and increased pumping lift costs. Well yield and specific capacity for modified screen intervals cannot be accurately estimated prior to construction of the new well. Drinking water supply wells constructed in a 100-year flood plain have costs associated with additional wellhead requirements. Changes in specific capacity may require different pumping equipment than was used in the existing well. If replacement wells are constructed under contract with MCDOT, additional costs for hydro geologic investigations and construction modifications, and potential risk of reduced yield and specific capacity should be negotiated with well owners who request an upgrade in replacement well construction from an agricultural well to a municipal drinking water supply well.

If replacement wells are to be used as sources for municipal drinking water supply, additional investigations will be necessary to evaluate the aerial and vertical distribution of water quality. To evaluate water quality of replacement wells, the following information for existing wells should be prepared and analyzed:

- Map – Contour map of groundwater quality for total dissolved solids, nitrate, and any other constituents of concern
- Table – Historical water quality data for nearby wells

A summary of the costs associated with well relocation and replacement is provided in Table 12-14.

Field investigations would include additional wellhead sampling of nearby wells to fill data gaps identified from maps and tables of historical water quality. The cost to conduct a preliminary review of available data and a wellhead sampling program for six wells is estimated to be approximately $26,000. Production logging of existing wells, including downhole spinner flowmeter and depth sampling, could be conducted to evaluate vertical distribution of well yield and water quality at an estimated cost of approximately $36,000 per well. Exploratory drilling, geophysical logging, and construction and testing of smaller diameter, temporary wells could also be used to evaluate water quality in areas where data are sparse at an estimated cost of approximately $136,000 per well.

Once a well site is selected, vertical distribution of well yield and water quality could also be evaluated by zonal sampling conducted during construction of the new production well by building temporary short-screened wells in the pilot borehole and obtaining samples from discrete intervals in the aquifer. The information would be used to design the screened interval of the well to avoid pumping water from aquifer intervals with poor quality water. Assuming zonal testing of four zones per well and the installation of cement seals, additional costs for testing and construction modifications to improve water quality are estimated to be approximately $62,000 per well.

12.16 RAILROAD

The proposed project affects the BNSF in two places: the branch line parallel to US 60 and the spur line parallel to Olive Avenue. Each area is discussed below.

Branch Line at US 60 Interchange

The design concept proposes a Stacked SPUI at the intersection of SR 303L and US 60 with the ramps to and from the north passing under the railroad. This configuration will require box-type structures to be constructed to carry each of four ramps under the BNSF branch line. This branch line consists of a single track centered in 200 feet of right-of-way.

BNSF has requested that provisions be included so that two commuter rail lines could be added, one on each side of the existing track. For commuter rail, BNSF wants the tracks to be separated by 25 feet, plus 25 clear distance on the outside. The resulting envelope would be 100 feet wide.

The existing pier for the Patriots Bridge is in the BNSF right-of-way but it still provides the 100-foot envelope. The position of the planned additional bridge for northbound traffic would have a different span length due to the curved ramp configuration under US 60. The clear distance between the planned new pier and the existing north pier is 92 feet. This information was provided to BNSF staff and they indicated that this reduced clearance would be acceptable.

To construct the structures to take the ramps under the railroad, a proposed shoo-fly to the north of the existing rail alignment would be constructed. This shoo-fly would allow construction of a portion of the railroad bridges, replacement of the main track on its original alignment and then completion of the remaining structures. The layout of the shoo-fly has the concurrence of BNSF and the geometry is such that it accommodates the Phoenix Subdivision speed of 49 mph. The layout allows for a minimum clearance to the new bridge piers of 25 feet.

The planned interchange at US 60 raises several issues that will need extensive attention during the next phase of project development. Substantial right-of-way will be needed from BNSF for the ramp and pier placement. BNSF has indicated that all land not included in the clear envelope and affected by the ramps or piers would have to be acquired.

Spur Line at Olive Avenue Interchange

The ultimate roadway design concept would elevate SR 303L to cross over the BNSF railroad tracks and Olive Avenue. A traffic interchange at Olive Avenue would result in at-grade ramp crossings of the railroad tracks for both the northbound on-ramp and southbound off-ramps. These ramp crossings would be located approximately 450 feet apart. Subsequently, ADOT has indicated that ramps crossing railroads at grade may not be acceptable and may convert the ramps to frontage roads. Olive Avenue traffic would enter and exit SR 303L at Peoria Avenue.

In reviewing the design with the BNSF, they generally were agreeable to the concept subject to the following conditions:

1. BNSF may want the approval of a new at-grade crossing to be tied to a not-to-exceed construction date of the mainline grade separation.
2. BNSF would permit placement of piers for the grade separation in their right-of-way. However, the piers should provide a minimum horizontal clearance of 25 feet to the centerline of the track. Furthermore, piers placed within the railroad right-of-way should be placed between Olive Avenue and the railroad tracks, leaving the north side of the railroad right-of-way clear of obstructions.

The at-grade railroad crossings for the ultimate ramps would need to have crossing gate protection and be interconnected to the traffic signals at the ramps and Olive Avenue. Any new at-grade railroad crossings would also need to be approved by the Arizona Corporation Commission.

The regional drainage channel will pass beneath the railroad just west of the proposed SR 303L at Olive Avenue. Assuming the track is still in operation at the time of constructing the SR 303L, building a structure to take the railroad over the channel will be problematic. A shoo-fly of the existing track could be an option. Further discussions with BNSF will be required to agree on an acceptable solution.

General Considerations with BNSF

BNSF will require full review and approval of structural designs and phase construction plans. BNSF will be responsible for design and construction of the shoo-fly but the cost will be borne by the project. BNSF will be responsible for construction of the at-grade crossing and flashers at the Olive ramps or frontage roads. All construction activities within the BNSF right-of-way will have to comply with BNSF requirements for flaggers. Obtaining permits and agreements with BNSF is often a lengthy process and should be started as soon as possible. The extra time needed for construction by BNSF needs to be factored into the overall construction schedule and phasing plan for the SR 303L corridor.

12.17 RIGHT-OF-WAY

The extent of the right-of-way requirements is shown on the roadway plans in Chapter 16.

Table 12-15 provides a summary of the right-of-way status for the project. There are 229.8 acres that were donated for the existing roadway that are not subject to the reverter clause. There have been 16.7 acres acquired by deed. A total of 254.7 acres have been preserved through donations but are subject to a clause that could have the property revert back to the owner. The reverter clause has been determined to be valid, and the amount of land to revert to the original owner is in discussions.

Table 12-15 Summary of Right-of-Way Status and Needs

	Acres
Donated for Existing SR 303L	229.8
Acquired by Warranty Deed	16.7
Donated or Easement with Reverter Clause	254.7
Total Preserved	501.2
Additional Right-of-Way needed for roadway	419.7
Additional Right-of-Way needed for drainage channel	539.6
Additional Right-of-Way needed for the I-10 realignment/widening	197.3
Total Right-of-Way for Project	**1,460.5**

Out of the 1,460.5 acres needed for the project (with the drainage system as shown in this DCR), 501.2 acres have been preserved. An additional 419.7 acres are needed for the construction of the roadway and 539.6 acres needed for the off-site drainage system as defined by the ADMP. It is highly recommended that this additional acreage be obtained as soon as possible. The existing right-of-way width for each crossroad varies dependent on the street classification and level of improvement. The I-10 realignment/ widening would require 197.3 acres of additional right-of-way. Del Webb, SunCor, and the owner of one small parcel have allowed right-of-way to be quit claim deeded to ADOT.

12.18 GUIDE SIGNS, SIGNALS, AND LIGHTING

Signing

For the initial and ultimate construction, all signing will be provided in accordance with ADOT and the MUTCD criteria for access-controlled highways and interchanges. System interchanges will require extensive overhead signage.

Traffic Signals

All existing traffic signals will be removed with the initial freeway construction of SR 303L. New signals will be placed at all service interchange ramp termini. Signals will also be needed at the intersection of frontage roads in the I-10 interchange and at the intersection of frontage roads and Van Buren Street and McDowell Road. A signal will also be needed at the intersection of ramps in the US 60 interchange.

Lighting

Initial freeway construction will have shoulder lighting as prescribed by ADOT. The ultimate configuration will have median lighting to supplement the shoulder lighting provided in the initial construction. High mast area lighting will be used at all three system interchanges and maybe used at service interchanges.

12.19 INTELLIGENT TRANSPORTATION SYSTEMS

Based on the criteria set forth in ADOT's Freeway Management System Infrastructure Design Guidelines, March 2001, when this facility is a fully developed freeway, the typical FMS design would include:

- **Detector Loops**: Located in mainline lanes at one-third-mile intervals and on ramps, supported with control cabinets, fiber optic modems and electrical power.
- **Closed Circuit Television**: Located for continuous coverage of the freeway and near critical locations. Along this corridor, there may be a dozen CCTV sites, supported with control cabinets, fiber optic modems and electrical power.
- **Variable Message Signs**: Located in advance of critical decision points or alternative route opportunities. Along this corridor, there may be two VMS in each direction, supported with control cabinets, fiber optic modems and electrical power.
- **Communication Trunk System**: Located along both sides of the freeway, bank of three 3-inch PVC conduits, concrete encased, containing fiber optic cables, power wires and supported with splice vaults and pull boxes. The FMS system uses a series of communications "nodes," requiring node buildings. A comprehensive communications plan that includes the corridor under study does not exist at present. (In the event ADOT decides a node building is required within the confines of this corridor, typical costs of such a facility are approximately an additional $250,000.)

A typical mile of freeway FMS, complete with fiber optic cable, all FMS elements and infrastructure has traditionally been approximately $1,120,000 per mile, in 2005 dollars. Design cost could be on the order of $300,000.

Typically, freeway construction projects do not contain the final FMS elements. These elements have tended to be separate stand-alone projects with CMAQ funding sources. Urban freeway projects do typically provide the opportunity to install the underground infrastructure such as the trunk conduit system and loop detectors.

The recommended course of action would be to install the FMS infrastructure as a part of the initial freeway construction and expansion for the ultimate design.

12.20 ACCOMMODATING TRANSIT AND HOV FACILITIES

The long term plans for SR 303L is to include HOV lanes. The ultimate typical section shown in Figure 11-1 presented in Chapter 11 indicates that the inside lane in each direction would be designated as an HOV lane. Current practice in the Phoenix metropolitan area restricts use of the lanes between the hours of 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM to vehicles with two or more people. Motorcycles and vehicles using alternatives fuels can also use the lanes during the restricted times.

A direct HOV connection from SR 303L north leg to I-10 east leg has been provided for in the layout of the I-10/SR 303L interchange. This connection would provide for one lane each for southbound to eastbound and for westbound to northbound HOV traffic. The layout of both I-10 and SR 303L include a wide median at the approaches to this major system interchange to accommodate future construction of the HOV direct connector.

The MAG Regional Transportation Plan adopted in November 2003 does not include construction of the HOV lanes on SR 303L or the construction of the HOV direct connector by 2025.

The MAG plan does include Bus Rapid Transit along SR 303L from I-10 to Bell Road and along both Bell Road and I-10. It also includes bus service as part of the "Super Grid System" on Bell Road from SR 303L eastward. A future park and ride lot is planned in the vicinity of SR 303L and Northern Avenue. Bus transit would be able to use the HOV lane and direct connector when those facilities are constructed in the longer-term future. In the shorter term, all transit vehicles would be able to use the general-purpose lanes on SR 303L.

12.21 LANDSCAPING AND AESTHETIC TREATMENT, FENCES

Landscaping will be provided on all embankment and cut slopes in accordance with ADOT Roadside Development Group Guidelines.

Concrete bridges and walls will be stained and rusticated in accordance with standard ADOT practice on the Phoenix area freeway system. Cast in place post tensioned concrete box structures will be used where practical if the bridge structure will be over traffic.

The right-of-way will be fenced or have sound walls to prevent pedestrian crossing of the right-of-way line.

12.22 EROSION AND SEDIMENT CONTROL MEASURES

Implementation of a SWPPP is required as part of the AZPDES General Permit during construction and stabilization of SR 303L. The plan is required to provide erosion and sediment control measures in accordance with ADOT's Erosion and Pollution Control Manual for Highway Design and Construction (June 1995), ADOT's Standard Specifications and FCDMC's Erosion Control Manual (January 1993).

Anticipated erosion and sediment control measures for SR 303L construction include:

- Silt fences along the toe of embankment slopes to treat sediment laden sheet flows
- Sediment wattles are installed along contours of high embankment slopes to treat sediment laden sheet flows
- Excelsior logs/sediment logs at the perimeter of storm drain inlets
- Temporary diversion dikes to reroute off-site stormwater runoff away from disturbed areas/grading locations
- Check dams along ditches to dissipate energy and prevent erosion/scour
- Rock inlet/outlet protection to prevent erosion at outlet of pipe or channel
- Sediment trap/basin to treat concentrated sediment laden flows
- Crown ditch/dike to convey flows
- Seeding to stabilize disturbed soils

In addition to the above measures, the SWPPP also requires:

- Solid waste management
- Designated washout areas
- Stabilized construction entrances
- Protected chemical and material storage areas

A spill prevention and response procedure is also required with a SWPPP.

The purpose of the SWPPP measures is to prevent pollution of washes and watercourses as well as to protect the groundwater resources in the project area.

12.23 BARRIERS

Standard ADOT concrete median and half barriers will be used on the freeways and ramps. The concrete median barrier will be 42 inches tall (ADOT Std. C-10.67). Concrete half-barrier will be 32 inches tall (ADOT Std. C-10.62) along the outside of the roadway to protect against obstacles in the clear zone or high fills. When the mainline or ramp crosses above another roadway, the concrete half barrier will be 42 inches tall (ADOT Std. C-10.63)

With the initial freeway construction for SR 303L, a median barrier may not be required as there would be a 74-foot open median. However, a Brifen wire rope safety fence may be installed to serve as a median barrier system, even with the wide median.

12.24 DESIGN EXCEPTIONS

A design exception would be required for all directional ramps at the I-10/SR 303L and Northern Parkway/SR 303L system interchanges with respect to horizontal sight distance. The degree of curvature of the system ramps is between 4° and 5°15', which would require anywhere from 16-foot to 28-foot inside shoulders, depending on the longitudinal grade and degree of curvature. ADOT standard calls for 6-foot inside shoulders on structures. Widening the ramp structures to accommodate the horizontal sight distance requirements would be prohibitively expensive. Conversely, flattening the ramp curves so that a 6-foot inside shoulder would satisfy the horizontal sight distance requirements would require prodigious amounts of right-of-way. Either approach is not practical. This design exception is typical for system interchanges throughout the Valley.

No other design exceptions have been identified.

12.25 SUGGESTIONS FOR NEXT PHASE OF DESIGN DEVELOPMENT

Several items were mentioned during 2005 that merit additional consideration. To expedite the completion of this document, ADOT requested that these items be tabled and considered during the next phase of design development:

- The City of Surprise requested consideration of SPUI interchanges at Cactus Road, Waddell Road, and Bell Road due to expected high traffic volumes.
- The Prasada (Cactus Lane Ranch) development has indicated they may want a mid-mile crossing of SR 303L between Cactus Road and Waddell Road. Developer contribution to the cost should be considered.
- Recent traffic forecasts received from MAG based on modifications proposed to the concept for Northern Parkway indicate that two-lane system ramps may be needed.
- Ramp SE in the Northern Parkway interchange is shown outside of Ramp NE. Consideration should be given to reversing the location of the two ramps.
- Element Homes has planned a major development east of SR 303 between Northern Avenue and Olive Avenue. They have proposed to realign Sarival to the east over 1,000 feet and have requested a full diamond interchange at Sarival. Inclusion of the ramps on the west side of Sarival will require some modifications to the SR 303L system ramps and may require a reduction in design speed on those ramps. The current plan is to keep Sarival on the section line and not provide ramps on the west side of Sarival.
- The City of Surprise is considering plans for a major north-south arterial from Bell Road to Northern Avenue or Olive Avenue. Extension of the Northern Parkway westward to link into this new arterial may have merit. If Northern Parkway is to be extended to the west of SR 303L, the interchange concept will require modification. The current plan includes one-way frontage roads extending westward on each side of Northern Parkway from the Sarival ramp terminus to the north-south frontage roads on each side of SR 303L.
- The DCR plans in Chapter 15 were based on a 46-foot median (prior to HOV lane construction). ADOT's new standard is 50 feet. The typical sections were updated to reflect the new standard but the plan sheets were not updated.
- A minimum vertical clearance of 16.5 feet was used over all cross roads. Consideration may be given to reducing the clearance to 15.5 feet over more minor streets with low truck volumes.